

ANDHRA PRADESH SOLAR POWER CORPORATION PRIVATE LIMITED
(A J V COMPANY OF GOVT OF ANDHRA PRADESH AND GOVT OF INDIA)

KURNOOL ULTRA MEGA SOLAR PARK (1000 MW)

**BIDDING DOCUMENT
FOR THE WORK OF**

Name of work: **APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P.**

SINGLE PART BID **TENDER SPECIFICATION**

NOTICE INVITING TENDERS (NIT) NO.
APSPCL-e-C- 23/2023-24/EE/Civil/APSPCL, Dt. 04.01.2024

**ANDHRA PRADESH SOLAR POWER CORPORATION PRIVATE LIMITED
KURNOOL ULTRA MEGA SOLAR PARK (1000 MW)**

TENDER NOTICE

Tender Notice No. APSPCL-e-C- 23/2023-24/EE/Civil/APSPCL, Dt. 04.01.2024

1.	Department Name	Andhra Pradesh Solar Power Corporation Private Limited (A J V Company Of Govt. Of Andhra Pradesh And Govt. Of India)
2.	Circle/Division Name	Executive Engineer / Civil / APSPCL / Guntur
3.	Tender Notice No.	<u>APSPCL-e-C- 23/2023-24/EE/Civil/APSPCL, Dt. 04.01.2024</u>
4.	Name of Work	APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P.
5.	Estimated Contract Value (Approximately)	Rs. 17,93,347/- (Rupees Seventeen Lakh Ninety Three Thousand Three Hundred and Forty Seven Only)
6.	Period of Contract	6 Months
7.	Form of Contract	L.S
8.	Tender Type	Open
9.	Tender Category	Works
10.	Transaction Fee Payable to MD/APTS payable at Vijayawada (including GST)	Rs. 635/- (Rupees Six Hundred and Thirty Five Only)
11.	Bid Security (EMD)	Rs. 18,000/- (Rupees Eighteen Thousand Only)
12.	Bid Security Payable to	By way of online payment in favour of Managing Director/APSPCL/ Tadepalli.
13.	Process Fee	Not Applicable
14.	Schedule Available Date & Time	04.01.2024, 5.00 P.M.
15.	Schedule Closing Date & Time	25.01.2024, 4.00 P.M.
16.	Bid Submission closing Date & time	25.01.2024, 5.00 P.M.
17.	Bid Submission	<u>Online</u>
18.	Bid Validity	180 days from the date of opening of the Bid
19.	Pre Bid Meeting	Not Applicable
20.	Pre Qualification/ Technical Bid Opening Date (Qualification and Eligibility Stage)	No separate technical bids are required. The bidder shall submit qualification details along with price bid. The price bids will be opened only for those who meet the eligibility criteria.
21.	Price Bid Opening Date & Time	29.01.2024, 03.00 P.M. (The price bids will be opened after verification of eligibility criteria)
22.	Eligibility Criteria	<u>1. Registration</u> (i) The bidder shall be registered as Class - IV (Civil) or above in any State/Central Govt. or any State/Central PSU etc. (ii) Registration under process shall not be accepted.

		<p>2. General Responsibility for correctness of the information submitted in the online bid lies with bidder. If any information furnished in the bid is proved to be false at a later date, the bid will not only be rejected but the bidder will be BLACKLISTED.</p>
23.	Place of Opening of Tenders	In the chambers of Executive Engineer/ Civil/APSPCL, Flat no: 501, 5 th Floor, Garuda Enclave, Beside TG Plaza, Tadepalli, Guntur-522501.
24.	Officer Inviting Bids	Executive Engineer/Civil/APSPCL/Guntur.
25.	Address &Contact Details	Executive Engineer/ Civil/APSPCL, Flat No. 501, 5 th Floor, Garuda Enclave, Beside TG Plaza, Tadepalli (V&M), Guntur District-522501. Phone: +91-9848113328. E-Mail: eecivil.apspl@gmail.com
26.	Procedure for bid submission	<p>a) The tender should be in the prescribed forms which can be obtained from 'e' procurement platform from the date of electronic publication up to the time and date indicated in the tender notice. The intending bidders shall enroll themselves on the 'e' procurement market-place www.apecprocurement.gov.in Those contractors who register themselves in the 'e' procurement market place can download the tender schedules at free of cost. The bidders shall authenticate the bid with his digital certificate for submitting the bid electronically on 'e' procurement platform and the bids not authenticated by digital certificate of the bidder will not be accepted on the e-procurement platform following the G.O.Ms.No.6, I.T&C Department, dated. 28-02-05.</p>
		<p>b) Intending bidders can contact office of the Executive Engineer/ Civil/APSPCL/Tadepalli/ Guntur – 522501 for any clarification/information on any working day during working hours</p> <p>c) The bidders who are desirous of participating in e-procurement shall submit their bids etc., in the standard formats prescribed in the tender documents, displayed at "e" market place. The bidders should invariably upload the statement showing the list of documents etc., in the "e" market place in support of their Technical bids. The bidder should upload scanned copies of all relevant certificates. The bidder shall sign on all the statements, documents, certificates, uploaded by him, owning responsibility for their correctness / authenticity.</p> <p>d) The Bidder shall authenticate the bid with his digital certificate for submitting the bid electronically on e-Procurement Platform and the bids not authenticated by Digital certificate of the bidder will not be accepted on the e-Procurement platform.</p> <p>e) The Department shall carry out the bid evaluation solely based on the uploaded documents, online payment towards EMD in the e-procurement system.</p> <p>f) The Department will notify the successful bidder for submission of original hard copies of all uploaded documents, prior to issue of LOI.</p> <p>h) The successful bidder shall invariably furnish the Original Certificates/documents of the uploaded scanned copies to the Tender Inviting Authority before stipulated time given to him either personally or through courier or post and the receipt of the same within the stipulated date shall be the responsibility of</p>

		<p>the successful bidder. The Department will not take any responsibility for any delay in receipt/non-receipt of certificates /documents, from successful bidder before the stipulated time. On receipt of documents, the Department shall ensure the gentility of all certificates documents uploaded by the bidder in e-procurement system in support of the qualification criteria before issue of LOI.</p> <p>i) If any successful bidder fails to submit the original hard copies of uploaded certificates/documents within the stipulated time or if any variation is noticed between the uploaded documents and the hard copies submitted by the bidder, the successful bidder will be suspended from participating in the tenders on e-procurement platform for a period of 3 years.</p>
		<p>The e-procurement system would deactivate the user ID of such defaulting successful bidder based on the trigger /recommendation by the Tender Inviting Authority in the system. Besides this, the department shall invoke all processes of law including criminal prosecution of such defaulting bidder as an act of extreme deterrence to avoid delays in the tender process for execution of the development schemes taken up by the Government.</p>
27.	Statutory Requirements	<p>The tenderer shall fulfill the following statutory requirements.</p> <p>a) <u>Labour Rules and Regulations</u> The tenderer shall comply with all statutory labour rules and regulations for EPF, GIS/ESI, Labour cess, Contract labour rules, Workmen compensation etc., as may be applicable.</p> <p>b) <u>GST</u> The tenderer should have registration under GST in the state of Andhra Pradesh from concerned department. The rates are exclusive of GST. Applicable GST on date will be allowed on the work done price against submission of GST invoice.</p>
28.	Other Payments to be made	<p>Apart from the Bid Security (EMD) the tenderer shall be liable to pay the following amounts:</p> <p>a) <u>Transaction Fee:</u> The participating bidders have to pay transaction fee of 0.03% (subjected to a maximum of Rs. 10,000.00) on estimated contract value of work with GST @ 18% i.e., Rs. 635/- (Rupees Six Hundred and Thirty Five Only) in favour of MD/APTS payable at Vijayawada at the time of bid submission electronically.</p> <p>b) <u>Corpus Fund:</u> Successful bidder has to pay Corpus fund @ 0.04% (subjected to a maximum of Rs. 10,000.00 for works with ECV/QV up to Rs 50.00 Crores and Rs 25,000.00 for works with ECV/QV more than Rs 50.00 Crores) through Online Payment in favour of Managing Director, APTS, Vijayawada towards corpus fund at the time of concluding agreement.</p>
29.	Documents to be submitted to the Tender inviting authority.	<p>All the bidders shall upload the scanned copies of the following documents on e-procurement system</p> <ol style="list-style-type: none"> 1) Online payment for EMD amount – This will be the primary requirement to consider the bid responsive. – Mandatory. 2) Contractor registration certificate – Mandatory.

		<p>Other optional documents:</p> <ol style="list-style-type: none"> 1. Registration copies of EPF, ESI/Insurance. 2. IT Returns, GST & PAN Registration. <p>Note:</p> <ol style="list-style-type: none"> 1. The tenderer is liable to be disqualified, if he is found to have mislead or furnished false information in the forms/ Statements/Certificates submitted in proof of qualification requirements and record of performance such as abandoning of work, not properly completing of earlier contracts, inordinate delay in completion of works, litigation history, financial failures and or participated in the previous tendering for the same work and has quoted unreasonable high price etc. 2. Even while executing the work, if found that the contractor had produced false/fake certificates, he will be black listed and the contract will be terminated and his Bid security will be forfeited and work will be carried out through other agency at his cost and risk.
30	Other relevant information	<ol style="list-style-type: none"> 1. APSPCL reserves the right to reject any or all the tenders without assigning any reasons thereof. 2. APSPCL reserves the right to amend or modify the tender and its conditions before 22.01.2024, 4.00 P.M. (The details will be updated in APSPCL web site) 3. Any other condition regarding receipt of tenders in conventional method appearing in the tender documents may please be treated as not applicable. 4. The contractors have to upload the information preferably in Zip format. 5. The contractors should upload the documents duly signing each and every paper. <p>For all clarifications & guidance, the bidders may contact the Executive Engineer/ Civil/APSPCL/Tadepalli/ Guntur – 522 501.</p>

Sd/-
EXECUTIVE ENGINEER/CIVIL

To
The Bidders through paper notification/web publication.

Copy submitted to

The Managing Director & CEO/APSPCL for favour of perusal.

Copy to:

- 1) Notice Board.
- 2) The Chief Financial Officer./APSPCL/Tadepalli for information.
- 3) The Deputy Executive Engineer/Civil/APSPCL/N.P.Kunta for information.
- 4) The Deputy Executive Engineer/Elec/APSPCL/Kurnool for information.
- 5) The Deputy Executive Engineer/Civil/APSPCL/Kadapa for information.

TENDER FORM

**To
The Managing Director,
APSPCL, Tadepalli,
Guntur – 522501.**

Sir,

I/We do hereby tender and, if this tender be accepted undertake to execute the work of **"APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P. "** as shown in the drawings and as described in the specifications deposited in the office of the **Executive Engineer/ Civil/ APSPCL, Tadepalli, Guntur-522501** with such variations by way of, alterations or additions to, and omissions from the said work and method of payment as are provided for in the "Conditions of Contract" **at the estimated contract value (ECV) PLUS (or) MINUS %** or such other sum as may be arrived at under the clause of the standard preliminary specification relating to "Payment on lump sum basis or final measurements at unit prices".

I/We agree to execute the work when the lump sum payment under the terms of agreement is varied by payment on measurement quantities.

I/We agree to keep the offer in this tender valid for a period of 180 days from the date of opening of tender and not to modify the whole or any part of it for any reason within the above period. If the tender is withdrawn by me/us for any reason whatsoever, within the validity period, the earnest money deposited by me/us will be forfeited to APSPCL.

I/We hereby distinctly and expressly declare and acknowledge that before the submission of my/our tender, I/We have carefully followed the instructions in the tender notice and have read the APSS and the Preliminary specifications therein and the APSS Addenda volume; and that I/We have made such examination of the contract documents and of the plan, specifications and quantities, and of the locations where the said work is to be done, and such investigation of the work required to be done, and in regard to the materials required to be furnished so as to enable me/us to thoroughly understand the intention of the same and the requirements, covenants, agreements, stipulations and restrictions contained in the contract and in the said plans and specifications and distinctly agree that I/We will not hereafter make any claim or demand upon the APSPCL based upon or arising out of any alleged misunderstanding or misconception or mistake on my/our part of the said requirements, covenants, agreements, stipulations restrictions and conditions.

If my/our tender is accepted, the earnest money shall be retained by the APSPCL as security for the due fulfillment of this contract. If upon written intimation to me/us by the Executive Engineer/Civil/APSPCL/Guntur, I/We fail to attend the said office before the end of the period specified on such intimation the tender will not be considered and if, upon intimation being given to me/us by the Executive Engineer/ Civil/APSPCL/Guntur of acceptance of my/our tender, I/We fail to make the additional security deposit or to enter into the required agreement as defined **in clause 4 of the detailed tender conditions**, then I/We agree to the forfeiture of the Earnest money; Any notice required to be served on me/us here under shall be sufficiently served on me/us personally or forwarded to me/us by post (registered or ordinary) or left at my/our address given herein. Such notice if sent by post be deemed to have been served on me/us at the time when in due course of post, it would have been delivered at the address to which it was sent.

I/We fully understand that the written agreement to be entered into between me/us and the APSPCL shall be the foundation of the rights of both of the parties and the contract shall not be deemed to be completed until the agreement has first been signed by me/us and then by proper officer authorized to enter into contracts on behalf of APSPCL.

I/We am/are professionally qualified and my/our qualifications are given below.

S.No.	Name	Qualifications

I/We will employ at my/our own cost at least **1 (One) number Graduate Engineer** and other technically qualified staff in adequate numbers on full time basis and see that they are available at work site during working hours and also whenever required by the Engineer in-charge to take instructions and for arranging efficient and expeditious execution of work to the satisfaction of the Engineer-in-charge. In case we fail to employ the above mentioned technical staff we are agreeable for the recovery towards such default to be made from our bills at the rate of **Rs.50,000/- (Rupees Fifty Thousand only) per month or part thereof.**

The APSPCL directs that in the case of both Lump sum and K2 contract of Rs. 50,000 and above in value, the contractor irrespective of his class shall be required to employ the personnel on the concerned works at his own cost whether technical skill is required or not.

The appointment of staff shall be on full time basis and they shall be available at the work site whenever required by the Engineer-in-charge to take instructions. The contractor shall deploy required technical personal in addition to the above as per actual needs and as directed by the Engineer-in-charge.

I/ We have accepted the rate of progress i.e., the construction programme for the work as envisaged in this tender specification.

PRE-QUALIFICATION REQUIREMENTS

- Not Applicable.

DETAILED TENDER NOTICE

1. Tenders in single part for the work of "**APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P.** " should be in the prescribed form which can be obtained from 'e' procurement platform from the date of electronic publication up to the time and date indicated in the tender notice. The intending bidders shall enroll themselves on the 'e' procurement market-place www.apecprocurement.gov.in. Those contractors who register themselves in the 'e' procurement market place can download the tender schedules free of cost. The bidder shall authenticate the bid with his digital certificate for submitting the bid electronically on e- procurement platform **and the bids not authenticated by digital certificate of the bidder will not be accepted on the e-procurement platform** following the G.O.Ms.No.6, I.T&C Department, dated. 28.02.2005.

The intending bidders can download tender specification and submit their tenders online at e-procurement market place viz., www.apecprocurement.gov.in. **The tender forms can be downloaded up to 4.00 PM on 25.01.2024. Bids can be submitted up to 5.00 PM on 25.01.2024 as per NIT.**

The Price Bids will be opened through e-procurement platform by the **Executive Engineer/Civil/APSPCL/Tadepalli on 29.01.2024 from 3.00 P.M** onwards as per NIT in his chambers at the address Flat no: 501, 5th Floor, Garuda Enclave, beside TG Plaza, Tadepalli, Guntur-522501. If the tender opening day happens to be a holiday the tenders will be opened at the same timings mentioned above on the next working day. The tenderers or their authorized agents are expected to be present at the time of opening of tenders.

Intending bidders can contact office of the *Executive Engineer/Civil/APSPCL/Guntur* for any clarification/ information on any working day during working hours

The bidders who are desirous of participating in e- procurement shall submit their Technical bid/Price bid etc., in the standard formats prescribed in the tender documents, displayed at "e" market place www.apecprocurement.gov.in. The bidders should invariably upload the statement showing the list of documents etc., in the "e" market place in support of their Technical bids. The bidder should load scanned copies of all relevant certificates. The bidder shall sign on all the statements, documents, certificates, uploaded by him, owning responsibility for their correctness/authenticity. **Responsibility for correctness of the information submitted in the online bid lies with bidder. If any information furnished in the bid is proved to be false at a later date, the bid will not only be rejected but the bidder will be BLACKLISTED.**

The Bidder shall authenticate the bid with his digital certificate for submitting the bid electronically on e-Procurement Platform and the bids not authenticated by Digital certificate of the bidder will not be accepted on the e-Procurement platform.

The Department shall carry out the technical bid evaluation solely based on the uploaded documents in the e-procurement system and open the price bids of the responsive bidders.

The Department will notify the successful bidder for submission of original hard copies of all uploaded documents prior to issue of LOI.

The successful bidder shall invariably furnish the original Certificates documents of the uploaded scanned copies to the Tender Inviting Authority before issue of LOI either personally or through courier or post and the receipt of the same within the stipulated date shall be the responsibility of the successful bidder. The Department will not take any responsibility for any delay in receipt/non-receipt of certificates/documents from successful bidder before the stipulated time. On receipt of documents, the Department shall ensure the genuinity of the all other certificates documents uploaded by the bidder in e-procurement system in support of the qualification criteria before issue of LOI.

If any successful bidder fails to submit the original hard copies of uploaded certificates/documents within the stipulated time or if any variation is noticed between the uploaded documents and the hard copies submitted by the bidder, the successful bidder will be suspended from participating in the tenders on e-procurement platform for a period of 3 years.

The e-procurement system would deactivate the user ID of such defaulting successful bidder based on the trigger/recommendation by the Tender Inviting Authority in the system. Besides this, the department shall invoke all processes of law including criminal prosecution of such defaulting bidder as an act of extreme of the deterrence to avoid delays in the tender process for execution of the development schemes taken up by the Government.

2. The bidder shall fulfill the following statutory requirements.

a) **Income tax Clearance Certificate:**

The contractor shall furnish their copy of permanent Account Number (PAN) card and copy of latest income tax returns submitted along with the proof of receipt.

b) **Labour Rules and Regulations:**

The contractor shall comply with all statutory labour rules and regulations for EPF, GIS/ESI, Labour cess, Contract labour rules, Workmen compensation etc., as may be applicable.

c) **Goods and Services Tax:**

The tenderer should have registration under GST in the state of Andhra Pradesh from concerned department. Applicable GST as on date is 18% of total value of the contract.

3. All the bidders shall invariably upload the scanned copies of the following documents on e-procurement system.

- 1) Online Payment for EMD amount - This will be the primary requirement to consider the bid responsive – Mandatory.
- 2) Contractor registration certificates – Mandatory.

Other Documents to be uploaded:

- 1) Registration copies of EPF, ESI/Insurance.
- 2) IT Returns, GST & PAN Registration.

Bid evaluation of the tenders would be done based on the certificates/ documents uploaded towards qualification criteria furnished by him/them.

In case of proprietary or partnership firm, it will be necessary to produce the certificates afore mentioned for the proprietor or proprietors and for each of the partners, as the case may be.

4. Earnest Money Deposit:

Each bidder must pay Bid Security i.e., Earnest Money Deposit of **Rs.18,000/- (Rupees Eighteen Thousand Only)** while submitting their bids. The EMD shall be **paid by way of online payment** in favour of Managing Director/APSPCL and payable at Tadepalli.

- i. The Earnest Money Deposit will be refunded to the unsuccessful tenderer after intimation of the rejection of the tender or at the expiration of 180 days from the date of tender whichever is earlier.
- ii. The Earnest Money will be retained in the case of successful tenderer and will not carry any interest. It will be dealt with as provided in the tender.
- iii. Tenderers are not permitted to withdraw their or his offer once made for a period of 180 days after the opening of the tenders and in the event of such tenderers withdrawing their tenders' within 180 days after opening of tenders, the Earnest Money deposited by him/them will be forfeited by the APSPCL

4.1 In addition to the EMD, the balance amount of total up to 5% of the value of contract shall be paid by the successful tenderer as security deposit by way of Bank Guarantee/Demand Draft from Nationalized Bank approved by APSPCL as per proforma appended at the time of entering into the agreement. The above security deposit shall be furnished within fifteen (15) days from date of receipt of award. Further, 5% of the value of work done will be recovered as retention amount from the running bills for the due fulfillment of the contract.

The Security deposit (including EMD) & Retention amount will be refunded to the contractor after satisfactory completion of performance guarantee period as all defects shall have been made good according to the true intent and meaning thereof. The guarantee period commences from the date of completion of the work in all respects satisfactorily. These amounts will not bear any interest.

4.2 Failure to enter into the required agreement or to make the security deposit as defined in the above paragraphs shall entail forfeiture of the earnest money deposit. The written agreement to be entered in between the contractor and the APSPCL shall be the foundation of the rights of both the parties and the contract shall not be deemed to be complete until the agreement has first been signed by the contractor and then by the proper officer authorized to enter into contracts on behalf of APSPCL.

4.3 The work shall be commenced from the dates specified by APSPCL, otherwise EMD will be forfeited.

If the successful tenderer fails to sign the agreement or otherwise commit default, the APSPCL shall have the right to recover damages according to law apart from forfeiting the earnest money deposit.

5. Period of contract: 6 Months.

5.1 Programme of work

The attention of the tenderer is directed to the contract requirements as to the time of beginning the work, the rate of progress and the dates for the completion of the whole work and its several parts.

The programme of work to be done from time to time is indicated below. However, the Executive Engineer / Engineer-in-charge of the work will decide the priority of various items of work and their location and direct the successful tenderer for execution so as to complete the entire work as required.

The date of commencement of this work will be the date on which the site is handed over to the Contractor. The agreement shall be concluded before the site is handed over to the contractor or before he draws any materials.

Further, it shall also be noted by the tenderer, if on any account, the work gets dislocated due to the site being not available for work on any day or due to any other reason, it is not binding on the APSPCL to pay any compensation to the contractor, but the corresponding extension of time will be granted to the contractor.

The construction programme for the works envisaged in the specification is indicated below:

S.No.	Period after date of commencement	Cumulative Percentage of the work to be completed based on contract amount	Remarks
(1)	(2)	(3)	(4)
1.	1 months	10 %	
2.	2 months	30 %	
3.	3 months	50 %	
4.	4 months	70%	
5.	5 months	90%	
6.	6 months	100%	

The periods entered in column (3) for the purpose of defining the rate of progress may be altered by the Engineer-in-charge or appropriate authority authorized by APSPCL to suit the requirements of project completion.

If, due to any other reason beyond the control of the contractor, the progress is slow during any period indicated above, the same shall be made up in subsequent periods and the programme shall be complied within minimum possible time.

The Executive Engineer / Engineer -in-charge shall direct the sequence and pace of the parts of the work and the contractor shall comply with them. Payment will be effected as per actual work completed and based on the approved mode of payment.

- 6. TERMS OF PAYMENT:** Payment for running bills shall be made to the contractor progressively, based on certification of the Executive Engineer/ Engineer-in-charge.

Penalty: Action as per clause 60 and 61 of PS to APSS will be taken by the Executive Engineer / Engineer-in-charge if the contractor fails to adhere to the above programme of work.

Due to what so ever reasons, if work gets extended beyond the contract period, an amount equivalent to 5% of running account bill will be recovered in the extended period of contract from the running account bills and release or forfeiture of this in part or full will be dealt as per the approval of competent authority of APSPCL.

7. The **Executive Engineer/Civil/APSPCL**, or other sanctioning authority reserves the right to reject any tender in full or part or all the tenders without assigning any reason there for. The quoted percentage shall be binding on the tenderer even if the **Executive Engineer/Civil/APSPCL** awards part of the work.

8. **TAXES, DUTIES, TOLLS AND SEIGNIORAGE:**

The contractor shall, unless otherwise specially stated in the tender notice and subsequently on this basis in the contract, be responsible for the payment wherever payable of all import duties, octroi duties, seigniorage, quarry fees etc. on all materials and articles that he may use.

All taxes, duties, seigniorage and local cess charges, Turnover etc, except GST, EPF, GIS & Labour Cess payable to the Govt./Quasi Govt. Bodies at the rates as on the date of opening of tender are deemed to be included in the quoted prices. **The applicable GST as on date will be paid extra on submission of GST invoice. The payment of GST is the responsibility of the contractor. Seigniorage on metal, sand, gravel etc., and local cess** will be recovered at rates fixed by competent authority from time to time from the contract bills and the same will be remitted to Mines & Minerals Department. However, **Seigniorage** charges will not be recovered if the contractor submits the proof of payment of **Seigniorage** charges to the concerned department. Statutory variations in the applicable rates or newly introduced taxes/duties, **Seigniorage** and local cess will be to APSPCL account subject to the condition that the work has to be completed as per the time schedule stipulated in the contract/agreement.

The percentage less/excess on ECV quoted for the subject work shall be excluding **GST, EPF, GIS, & Labour Cess. EPF & GIS** will be reimbursed by APSPCL on production of proof of actual remittances made and subject to the satisfaction of Engineer-in-Charge that the said contribution done is only for the workers employed on this work. Labour cess will be reimbursed to the contractor as per actual on production of proof of payment as per the building and other construction welfare cess act 1996. APSPCL will not reimburse any excess payment made by the contractor for any of the above due to mis-interpretation of law or any other reason.

No GST will be collected from the contractor for the materials supplied by the APSPCL at free of cost.

Notwithstanding anything contained in Section 10 of the Indian Tariff Act, of 1894, the rates for item involving the use or supply of articles obtained by the contractor from outside India shall remain unaffected by any changes that may be introduced in the Customs duties.

Other taxes and duties levied by the Central/State Govt. prevailing as on the date of opening of tenders shall be to the contractor's account and the percentage less/excess on ECV value quoted shall be inclusive of them. Any increase in taxes and duties shall be to APSPCL's account. If there is any decrease in taxes and duties, credit shall be given to APSPCL to that extent.

The APSPCL will not however be responsible for payment any other tax made by the contractor under misapprehension of law.

9. **Supplemental Items:**

The contractor is bound to execute all supplemental items beyond 10% of agreement quantity, deductible from similar items in the original agreement and new items that are found essential, incidental and inevitable during execution of main works, at the rates to be worked out as detailed below.

a. Fixation of rates for items of work in excess of quantities in Schedule-A Bill of Quantities of tender

The percentage less/excess on ECV quoted by the tenderer shall hold good up to 10% of quantity over those given in Bill of Quantities. Approval of competent authority is to be obtained for execution of quantities in excess of 10% beyond agreement quantity and supplemental items and new items.

For all items of work which are in excess of 10% over and above the quantities shown in Schedule-A Bill of Quantities of the tender, the rate payable for such excess quantities shall be either agreement rates or sanctioned estimate rates plus or minus overall tender percentage accepted by the competent authority whichever is less.

b. Supplemental items directly deducible from similar items in the original agreement

The rates shall be derived by adding to or subtracting from the agreement rates of such similar items, the cost of the difference in quantity of material or labour between the new item and the similar item in the agreement worked out with reference to the schedule of rates adopted in the sanctioned estimate with which the tenders were compared plus or minus overall tender percentage.

c. New Items:

i) Similar items, the rates of which cannot be directly deduced from the original agreement.

ii) Purely new items which do not correspond to any item in the agreement.

The rate shall be estimate rate plus or minus overall tender percentage.

Note: in the term estimate rate used (i) and (ii) above means the rate in the sanctioned estimate with which the tenders were compared or if no such rate is available in the estimate, the rate derived with reference to the schedule of rates adopted in the sanctioned estimate with which tenders are compared.

d. Addition of provision towards importation of labour, labour amenities, dewatering etc., in working out supplemental items:

In respect of new items, the case has to be considered on its merits and provision for importation of labour, labour amenities, dewatering etc., has to be fully justified.

If the new item is in substitution of an old item which allowed for importation of labour, labour amenities, dewatering etc., those factors may be taken into account in computing the substituted items also at the same rates at which they were originally provided.

10.0 The clause 69 (b) of PS to APSS is deleted. The following may be read in its place:

"Whenever the withheld amount reaches Rs.1,000/- or a multiple thereof, the contractor may, at his option, to deposit with the Engineer-in-charge, an equal amount in sum of Rs.1,000/- or multiples thereof in any of the forms of interest bearing securities recognized for the purpose by A.P. Public Works Accounts Code and subject to the provisions therein contained or a Bank Guarantee of a Nationalized Bank in which case the equivalent withheld amount shall be paid to him forthwith."

The contractor will be permitted to exercise the option in this clause, subject to the condition that the rate of progress contained in the Articles of Agreement is properly maintained.

- 11.0** Preliminary specifications of APSS except clause 73 shall apply to all agreements entered by the contractor with APSPCL and shall form an inseparable condition of the contract. The tenderer is expected to examine closely the relevant specifications of the APSS and the special specifications and ISS before submitting his tender offer.

Note: In case of contradiction between the clauses included in this specification and the clauses of PS to APSS the former will prevail over the latter and is binding on the tenderer.

12.0 ARBITRATION

All or any disputes or differences arising out of or touching the order based on this specification shall be decided by a panel of arbitrators as detailed below and as per arbitration act No.1 of 1990 to the Arbitration Act 1940 amended vide G.O.No.7 dt.19-05-1990.

<i>Value of claim</i>	<i>Panel of Arbitrators</i>
Disputes involving amounts up to Rs. 10,000/- and below.	Executive Engineer of the APGENCO other than the circle to which the disputes relate.
Disputes involving amount from Rs. 10,000/- to Rs. 50,000/-	Any Chief Engineer of the APGENCO other than concerned Chief Engineer.

There shall not be any reference of disputes, the value of which is above Rs.50,000/- to arbitration. The parties shall approach the competent Civil Courts having jurisdiction, if any such disputes shall arise.

TENDERER'S AND CONTRACTOR'S CERTIFICATE

- a) We expressly state that we will be bound by the conditions of PS to APSS and that the contract shall be deemed to be concluded on the receipt of letter of acceptance. If thereafter we do not sign the contract or otherwise commit default, the APSPCL will be at liberty to forfeit the earnest money and recover damages in accordance with law.
- b) We hereby declare that we have perused in detail and examined closely in the APSS all clauses of preliminary specifications and have either examined all the standard specifications for items for which we tender, before we submit such tender and we agree to be bound by and comply with all such specifications for all agreements which we shall execute in the APSPCL. We have signed here below in acknowledgement thereof.
- c) We certify that we have inspected the location of the proposed work before quoting our percentage, we have also inspected the source of materials and network of roads and satisfied ourselves about the quality, availability and transport facilities for required materials through the net work of available roads and path-ways, required for the work and verified the correctness of the leads statement.
- d) We are prepared to furnish detailed data in support of all our quoted percentage, when called upon to do so without any reservations.

Signature of Tenderer/contractor

Name : _____

Designation : _____

Company : _____

Date : _____

Seal of Company

SECTION - I

SUPPLEMENTAL CONDITIONS TO THE PRELIMINARY SPECIFICATIONS TO THE APSS

The following conditions shall also be followed in addition to those mentioned in P.S. to the A.P.S.S.

1. FUNCTIONING OF THE CONTRACT

The contractor shall carryout all directions and orders issued by the Executive Engineer / Engineer – in – charge connected with the work and shall communicate with him regarding all matters pertaining to the contract.

2. CONTRACT INCLUDES ALL NECESSARY OPERATIONS

The contractor is to include the whole of works whether permanent or temporary which are described in or implied by the contract documents, which may be inferred to be obviously necessary for the efficiency, stability and completion of the permanent works, also the performance of all other operations and the supplying of all materials and things described in or implied by the contract documents which may be deemed desirable or required for the completion in all respects of the above works to the entire satisfaction of the Executive Engineer / Engineer – in – charge and all such matters shall be deemed to be included in the contract.

Works shown in the drawings and not mentioned in the specifications or described in the specifications without being shown in the drawings shall nevertheless be held to be included in this contract, in the same manner as if they had been expressly shown in the drawings and described in the specifications also.

3. OTHER CONTRACTS FOR THE WORK:

Should the APSPCL enter into other contracts for specified items of the corporate work, each contractor shall co-operate with others to the fullest extent and shall allow each other every facility and co-ordination for execution of their works simultaneously and satisfactorily as intended in the designs, specifications and drawings. Should there be dispute or disagreement between the contractors for any cause whatsoever, the same shall be referred to the Executive Engineer / Engineer – in – charge whose decision regarding the co-ordination, co-operation, and facilities to be provided by any of the contractors to the others shall be final and binding on all parties and such a decision shall not vitiate any contract nor absolve the contractor of his responsibilities under the contract.

4. SAFETY MEASURES

The contractors shall take all necessary precautions for the safety of workers and in preserving their health while working in such jobs as require special protection and preventive steps. The following are some of the measures listed but the same are not exhaustive and the contractor shall add to and augment these precautions on his own initiative where necessary and shall comply with the directions issued by the Executive Engineer / Engineer – in – Charge in this behalf from time to time, and at all times.

- i) Providing protective foot wear to workers in site situations like mixing and placing of mortar or concrete in places where the work is done under too much wet conditions.
- ii) Taking necessary steps towards training the workers concerned on the machinery before they are allowed to handle them independently and taking all necessary precautions in and around the areas where machines, hoists and similar units are working.

SECTION - II

SITE CONDITIONS

1. LOCATION & GENERAL DESCRIPTION

Kurnool Ultra Mega Solar Park site is situated at about 40 KM from Kurnool. The nearest Railway station is Kurnool. Nearest town is Kurnool. The project information and data is given below:

1.01	Owner / Purchaser	:	Andhra Pradesh Solar Power Corporation Private Limited (A J V COMPANY OF GOVT OF ANDHRA PRADESH AND GOVT OF INDIA)
1.02	Project Title	:	Kurnool Ultra Mega Solar Park
1.03	Nearest Railway Station	:	Kurnool (40 KM from site)
1.04	Name of Railway	:	South Central Railway
1.05	Nearest Airport	:	Tirupathi (220 KM from site)
1.06	Altitude	:	(+) 430 m EL above mean sea level
1.07	Climate	:	Tropical-Hot-Humid
1.08	Ambient Temperature (Dry Bulb)		
	a) Daily maximum (Mean)	:	33.0 Deg. C
	b) Daily minimum (Mean)	:	25.0 Deg. C
1.09	Relative Humidity		
	a) Maximum Humidity	:	64 percent
	b) Minimum Humidity	:	35 percent
	c) Average Humidity	:	49 percent
1.10	Rainfall		
	a) Maximum intensity	:	60 mm per Hour
	b) Annual Average	:	560 mm
	c) Tropical monsoon	:	June to October
1.11	Wind Velocity & Pressure (As per IS: 875-1987 Part III)		
	Basic Wind Speed	:	50 m/sec
1.12	Seismic Zone	:	Zone II as per IS: 1893-2002
1.13	Transport		
	a) Name of highway near which the plant is located	:	Tadipatri to Jammalamadugu High way
	b) Railway (Gauge)	:	Broad Gauge.

2. SITE CONDITIONS

Before submitting the tender, the tenderer shall familiarize himself with the site conditions.

SECTION – III

RULES FOR PROVISION OF HEALTH AND SANITARY ARRANGEMENTS TO WORKERS

Rules for the provision of health and sanitary arrangements for workers shall be applicable to all classes of workers. The Contractor's special attention is invited to Clause 37, 38, 39 & 51 of PS to the APSS and he is requested to provide amenities like First Aid, Drinking Water etc at his own expense to the satisfaction of the Executive Engineer-in-Charge.

SPECIAL CONDITIONS OF CONTRACT

1.0 GENERAL

1.1 The word 'Special Conditions' shall be understood to cover all elements **effective in determining unit prices such as availability of materials**, price of materials, quantity and quality of available labour and their cost, or every other factor whatsoever, of major or secondary importance which has to be accounted for in quoting prices.

1.2 For the work covered by the Technical Specifications (Section IV) the bidder shall quote his percentage less/excess on ECV value based on the Bill of quantities (Schedule 'A') in words and figures.

Said percentage less/excess on ECV value shall bind on the bidders and shall include any expense whatsoever in connection with the delivery of materials at field site, the use of tools and equipment, cost of technical staff and labour and every other charge connected with and incidental to the complete and through execution of work.

1.3 The bidder shall make at his own risk and cost, before submitting his tender, all surveys he might consider necessary and he may carry out any market survey or technical enquiry he might require to check either the suitability of available materials or the site conditions, soil conditions etc. Permission to visit site will be granted to those bidders who have purchased the tender documents.

1.4 The contractor shall note that the scope of work and the quantity of individual items of work may vary to any extent (on the plus or minus side) as necessary during execution. The contractor shall be bound to execute all the works including above variation in quantity of individual items and extra items or additional items of work shall be executed by him as per the relevant clauses of the contract. In awarding the work against the subject specification to the contractor, APSPCL reserves the right to take out of the scope of the contract part of the work. The contractors shall have no claim for loss of profit sustained because some portions of the original contract have been allocated elsewhere nor will this be reason for the contractors to increase/decrease the percentage for the remaining portion of the contract which he shall fulfill in accordance with the contract.

The preliminary estimated quantities given in the Schedule 'A' are not to be taken as binding figures and they may vary to any extent. These quantities have been provided only for the purpose of providing a comparison of various proposals and to give bidder approximate information as to the amount of work to be performed. The total value of work actually carried out shall be measured and paid for.

1.5 Technical Specifications

Technical specifications for major items are described in section IV of this document. For those items which may not be covered under Section IV, the contractors shall follow the relevant Indian Standard Specifications (latest edition) with the approval of the Engineer-in-charge/Engineer-in-Charge.

1.6 Special Notes

The contractor shall be responsible for any delay and damage except due to force majeure reasons which are generally beyond their control and for this full justification elaborating such circumstances shall be furnished by them.

- 1.7 The contractor shall be under no liability whatsoever for damage or destruction to the work or temporary work or materials and equipment or to property or like which is due to acts of God, earthquake, lightening, gale, typhoon, storm, hurricane, or act of any Government or Strikes or Lockouts or converted action of workmen or civil War (Whether declared or not) or sabotage explosion, Civil commotion, Police action, revolution, epidemics etc., destructive artesian conditions, nuclear fusion, or Radio active disturbances etc., which they have no control and directly or indirectly affecting the operation of the contract.

- 2.0 **Tenders quoted abnormally less, i.e., more than 15%, a B.G obtained in favour Managing Director/APSPCL on the any Nationalized bank or scheduled bank payable at Tadepalli for the difference between the tendered amount and 85% of the estimate value shall be furnished by the contractor invariably as additional security deposit. The period of validity of B.G shall be for a minimum period of six months. This B.G. shall not bear any interest. On successful completion of the work, the B.G. will be returned to the contractor. The period of validity shall be extended by the contractor from time to time till the B.G. is returned.**

In case of contractors failing to complete the work at agreement rates, the B.G. furnished will be forfeited by the APSPCL

GENERAL CONDITIONS OF CONTRACT

1.0 DEFINITION & INTERPRETATIONS

In these general conditions of contract the following terms shall have the meanings assigned to them except where the context otherwise required.

- 1.1 "OWNER/CORPORATION" means Andhra Pradesh Solar Power Corporation Pvt., Limited (A J V Company Of Govt., Of Andhra Pradesh And Govt., Of India) and shall include their legal representative, successors and permitted assignees.
- 1.2 The "Contractor" means the individual or firm or company whether incorporated or not, under taking for execution of works and shall include legal representatives of such individual or persons composing such firms or unincorporated company successors of such firms or company as the case may be, and permitted assignees of such individual or firm or company.
- 1.3 "Contract" means the notice inviting tender, the tender and acceptance there of and the formal agreement, if any, executed between Andhra Pradesh Solar Power Corporation Pvt., Limited and the contractor together with the documents referred to therein including those conditions with appendices and any special conditions, the specifications, designs, drawings, schedule of quantities with rates and amounts and schedule of rates. All these documents taken together shall be deemed to form one contract and shall be complementary to one another.
- 1.4 The "Engineer-in-charge" means the engineering officer appointed by the corporation or his duly authorized representative who shall direct, supervise and be in charge of the works for the purpose of this contract.
- 1.5 "Work" means the works to be executed in accordance with the contract.
- 1.6 "Specifications" means the specifications forming a part of the contract for materials and works for the execution of the contract and as amplified, added or specified by special specifications, if any.
- 1.7 "Site" means the lands and or other place on, under on or through which the work is to be executed under the contract including any other lands or places which may be allotted by the corporation or used for the purpose of the contract.
- 1.8 "Letter of Award" shall mean the official notice issued by the OWNER notifying the contractor that his tender has been accepted.
- 1.9 "Guarantee period" shall mean the period during which the contractor shall remain liable for repair of any defect of the works performed under the contract.
- 1.10 Where the context so requires, words imparting the singular only also include the plural and vice-versa.
- 1.11 Heading & marginal notes to those General conditions shall not be deemed to form part thereof or be taken into consideration in the interpretation or construction there of or of the contract.
- 1.12 All the documents pertaining to the contract including specifications, schedules correspondence etc., shall be written in English language.

2.0 CONTRACTOR TO INFORM HIMSELF THE FOLLOWING:

- 2.1 The contractor shall be deemed to have carefully examined all contract documents to his entire satisfaction. If he shall have any doubt as to the meaning of any portion of the contract documents, he shall, before signing the contract, set forth the particulars thereof and submit them to the corporation in writing in triplicate, in order that such doubts may be removed. The corporation will provide such clarification as may be necessary in writing to the contractor. Any information otherwise obtained from the corporation or the ENGINEER shall not in any way relieve the contractor of his responsibility to fulfill his obligations under the contract.

3.0 DISCREPANCIES AND ADJUSTMENT OF ERRORS:

- 3.1 If there are varying or conflicting provisions made in any documents forming part of the contract, the Managing Director shall be deciding authority with regard to the intention of document.
- 3.2 Any error in description, quantity or rate in schedule of quantities or any omission there from shall not vitiate the contract or release the contract from the execution of the whole or any part of the works completed therein according to the specification or from any of his obligations under the contract.
- 3.3 If on check, there found to be differences, between the percentage less/excess on ECV value given by the contractor in words and figures by him in the Schedule of quantities and general summary the same shall be adjusted in accordance with the following rules.
- a) In the event of a discrepancy between description in words and figures quoted by a tenderer, the description in words shall prevail.
 - b) The under signed does not bind himself to accept the lowest or any tender. The undersigned reserves the right to reject any or all tenders without assigning any reason.
 - c) Persons tendering must acquaint themselves and satisfy as to the physical conditions prevailing at the site.
 - d) No telegraphic/Fax offers will be entertained and APSPCL Ltd will not consider any postal delay.
 - e) The APSPCL reserves the right of deleting any or all items of the works mentioned in the schedule without assigning any reasons thereof. The tenderer will not be eligible to claim any sort of compensation in this regard.
 - f) The contractor shall provide to his workmen the required safety appliances including protective clothing and guards such as helmets, safety shoes, hand gloves, masks, safety belts etc., for working in Hazardous areas which shall be identified by the Engineer-in-charge.
 - g) The contractor will be required to work either in hot or cold areas, near machines in operation otherwise involving special care on part of the contractor to see that the work is carried out with safety to the men and machines and without hampering the working of the concerned departments of the corporations.

4.0 SUBLETTING OF WORKS

- 4.1 The contractor shall not assign or sublet the contract or any part thereof, allow any persons to become interested therein in any manner whatsoever without the special written permission of Executive Engineer / Civil / APSPCL / Tadepalli. The contractor can sublet only up to a maximum of 50% of contract with the prior approval of Executive Engineer / Civil / APSPCL / Tadepalli. Any breach of this condition shall entitle the corporation to rescind the contract and also render the contractor liable for payment to corporation in respect of any loss or damage arising or ensuring from such cancellations. The permitted subletting of work by the contractor shall not establish any contractual relationship between the sub-contractor and corporation and shall not relieve the contractor of any responsibility under the contract. In the event of sufficient dues not being available to reimburse corporation for the expenditure incurred by it for the above contractor shall reimburse corporation for the same.

5.0 ELECTRICAL SAFETY REGULATIONS

- 5.1 In no circumstances shall the contractor interfere with the fuses and electrical equipment belonging to the APSPCL or other contractors. Before the contractor connects and electrical appliances to any Board or Socket belonging to other contractors or APSPCL shall:
- a) Satisfy and obtain permission of the Engineer-in-charge to that effect.
 - b) No electrical cable used by the contractor will be disturbed without prior permission.
 - c) No weight of any description will be imposed on any such cable and no ladder or equipment will rest against or be attached to it. No work shall carry or any live equipment without PERMIT TO WORK.

6.0 FIRE PROTECTION

- 6.1 The work procedures that are to be used during the execution of work shall be those, which minimize fire hazards to the extent practicable. Combustible materials, combustible waste and rubbish shall be collected and removed from the site at least once in a day. Fuel oil, volatile or flammable materials shall be stored away from the work areas in safe containers. All the materials such as working drawings, documents etc., which are combustible but essential for the works to be executed shall be protected against combustion resulting from welding sparks, cutting, flanges and other similar fire sources, while doing welding, gas cutting work at elevated levels all care should be taken to protect sparks falling down by providing suitable coverage to avoid free fire and ensuring safety to personnel working in neighborhood.

7.0 SECURITY

- 7.1 The tenderer/Contractor shall have total responsibility for all equipment and materials in his custody, loose, semi-assembled and/or erected serviced overhauled by him at site. The Tenderer/Contractor shall make suitable security arrangements including deployment of security personnel to ensure the protection all materials, equipment and works from theft, fire, pilferage and any other damages and loss.

8.0 DEFECT LIABILITY

The contractor shall be responsible to make good and remedy at his own cost within such a period as may be stipulated by the Engineer-in-charge any defect observed during the course of execution or which may develop or may be noticed before the expiry of the period mentioned in the Guarantee clause on intimation of which has been sent to the contractor within seven days of expiry of the said period by a letter sent by hand or Registered post.

9.0 GUARANTEE:

- 9.1 The contractor shall guarantee that all items executed by him shall be free from all defects and workmanship up to completion of work in all respects.
- 9.2 APSPCL shall also be entitled to recover any losses direct or indirect incurred due to non-fulfillment of contractual commitment in this regard.
- 9.3 The Guarantee period shall be 24 (Twenty Four) months from the completion of the works in all respects.

10.0 URGENT WORKS

- 10.1 If any urgent work (in respect where for the decision or Engineer-in-charge is final and binding) becomes necessary and the contractor is unable or unwilling at once to carry it out the Engineer-in-charge may by his own or other people, carry it out as he may consider necessary if the urgent work is such as a contractor is liable under the contract to carry out at his expense. All expenses incurred on it by the corporation shall be recoverable from the contractor and be adjusted or set off against any sum payable to him.

SECTION – IV

TECHNICAL SPECIFICATIONS

1.00 GENERAL

- 1) This specification is to cover for the proposed work of **"APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P."** promoted by M/s. Andhra Pradesh Solar Power Corporation Pvt., Limited.
 - 2) Description of various items of work under this specification and nature of work in detail are given hereinafter. The complete work under this scope is referred to as CIVIL WORKS. List of various civil works covered given under the scope.
 - 3) The work to be performed under this specification consists of providing all labour, materials, consumables, equipment, temporary works, temporary labour and staff colony, constructional plant, fuel supply, transportation and all incidental items not shown or specified but reasonably implied or necessary for the completion of the work, all in strict accordance with the specifications and including revisions and amendments thereto as may be required during the execution of the work.
 - 4) All materials shall be arranged by the CONTRACTOR.
 - 5) The scope shall also include setting up of complete testing laboratory, by the CONTRACTOR, in the field to carry out all relevant tests required for the civil works for the project.
 - 6) The work shall be carried out according to the approved drawings by the APSPCL. Necessary layout and details are to be developed by the CONTRACTOR keeping in view the statutory & functional requirements and facilities of the proposed work. The quantities given in the Schedule of quantities are approximate and likely to change as per the approved drawings.
 - 7) CONTRACTOR shall inspect the site, examine and obtain all information required and satisfy himself regarding matters and things such as access to site, communications, transport, right of way, the type and number of equipment and facilities required for the work, availability of local labour, materials and their rates, local working conditions, weather, flood levels, subsoil conditions, natural drainage , etc., The contractor shall organize his own arrangements to transport his equipment, men and materials so as to match the construction schedules. Ignorance of the site conditions shall not be accepted by the APSPCL as basis for any claim for compensation or extension of time. The submission of a bid by the CONTRACTOR will be construed as evidence that such an examination was made and any later claims / disputes in this regard to rates/lump sum quoted shall not be entertained or considered by the APSPCL.
- 1.1.** The bidders shall resolve himself the local issues, if any, during the execution without any financial implications to APSPCL.

2.00 Statutory Requirement

CONTRACTOR shall comply with all the applicable statutory rules pertaining to Factory act, Fire safety rule of Tariff Advisory Committee, Water act for Pollution control, Explosives act etc. Provisions of Safety, health and welfare according to Factories act shall also be complied with. Statutory clearances and norms of State

Pollution Control Board shall be followed. APSPCL will assist in obtaining the necessary clearances from other departments.

- 3.00** The specifications for various works should confirm to the relevant clauses of the APSS, Earth manual of USBR, MORD & MORTH and also to the special specifications included in the tender schedule. If there is any difference between them, the special specifications will be applicable. If for any item of work, detailed specifications are not indicated either in the technical specifications or in the APSS and Earth manual of USBR, MORD & MORTH then that work shall be carried out as per the instructions of Engineer-in-charge. The execution of work and tests to be conducted during construction and on the materials shall confirm to the latest relevant I.S codes.

4.00 SCOPE OF WORK:

In general broad scope of work consists of the following:

- 1) Forming embankment with borrowed useful soil.
- 2) Providing PCC 1:3:6 nominal mix.
- 3) Providing weep holes in Plain cement concrete abutment.
- 4) Providing and laying cement concrete wearing course M 30 grade.
- 5) Providing and laying reinforced cement concrete pipe of 600 mm dia NP3.
- 6) Supply, fabrication and erection of MS hand Rail over Bridge parapet wall.
- 7) Providing and laying reinforced cement concrete pipe of 450 mm dia NP3.

The work shall complete in all respects under this specification shall include but not limited to the following.

5.00 FORMING EMBANKMENT WITH BORROWED USEFUL SOIL:

The firm shall Forming embankment with borrowed useful soil by mechanical means with all leads and lifts including cost and conveyance of soil, pre-watering of soil at borrow area, removal of top soil, excavation of soils at borrowed area, depositing the soils, spreading soils, breaking clods, sectioning and consolidation with Vibratory Road Roller @ OMC to meet requirement of table 300-2 of MORT&H, including all hire and operational charges of T&P etc complete for finished item of work as per MORT&H specification 305 (4th revision). Payment will be made based on level for finished item of work.

- 5.01 MODE OF PAYMENT:** The payment shall be made on the basis of Cum.

6.00 PROVIDING PCC 1:3:6 NOMINAL MIX:

The firm shall Providing PCC 1:3:6 nominal mix for body walls, wing walls & returns Walls etc., using 40mm, 20mm & 10 mm nominal size Graded hard stone aggregate for leveling course, mechanically mixed, placed in foundation and compacted by vibration including curing for 14 days etc complete as directed by the engineer-in-charge and as per drawings & as per SS 402 of APDSS.

- 6.01 MODE OF PAYMENT:** The payment shall be made on the basis of Cum.

7.00 PROVIDING WEEP HOLES IN PLAIN CEMENT CONCRETE ABUTMENT:

The firm shall providing weep holes in Plain cement concrete abutment, wing wall, return wall with 100 mm dia PVC pipe extending through the full width of the structures with slope of 1(V):20(H) towards drawing face complete as per

drawing and technical specification Clause 1206 MORD complete finished item of work as directed by the Engineer-in-charge.

7.01 MODE OF PAYMENT: The payment shall be made on the basis of No's.

8.00 PROVIDING AND LAYING CEMENT CONCRETE WEARING COURSE M 30 GRADE:

The firm shall Providing and laying cement concrete wearing course M 30 grade including reinforcement using 20 & 12 mm nominal size Graded hard stone aggregate for wearing course, mechanically mixed, placed and compacted by vibration including curing for 14 days etc complete as directed by the engineer-in-charge and as per drawings & as per SS 402 of APDSS.

8.01 MODE OF PAYMENT: The payment shall be made on the basis of Cum.

9.00 PROVIDING AND LAYING REINFORCED CEMENT CONCRETE PIPE OF 600 MM DIA NP3:

The firm shall Providing and laying reinforced cement concrete pipe of 600 mm dia NP3 for culverts on first class bedding of granular material including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head wall and parapets. Tech Specification Clause 1106 MORD.

9.01 MODE OF PAYMENT: The payment shall be made on the basis of RM.

10.00 SUPPLY, FABRICATION AND ERRECTION OF MS HAND RAIL OVER BRIDGE PARAPET WALL:

The firm shall Supply, fabrication and errection of MS hand Rail over Bridge parapet wall and other required supporting structure of Jindal, Vizag, SAIL, Tata or any other equivalent make as directed by the engineer-in-charge including cost and conveyance of all materials, labour charges, including painting two coats with synthetic enamel paint over one coat of red Oxide paint all leads and lifts etc complete. Complete finished item of work as directed by Engineer in Charge

10.01 MODE OF PAYMENT: The payment shall be made on the basis of Kg's.

11.00 PROVIDING AND LAYING REINFORCED CEMENT CONCRETE PIPE OF 450 MM DIA NP3:

The firm shall Providing and laying reinforced cement concrete pipe of 450 mm dia NP3 for culverts on first class bedding of granular material including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head wall and parapets. Tech Specification Clause 1106 MORD.

11.01 MODE OF PAYMENT: The payment shall be made on the basis of RM.

SCHEDULE – A**BILLOF QUANTITIES**

- a) The quantities given in the bill of quantities are approximate but they are subject to alterations, omissions, deductions or additions as provided for in the conditions of this contract and do not necessarily show the actual quantities of work to be done. The unit rates noted below are those governing payment of extras or deductions for omissions according to the conditions of the contract as set forth in the preliminary specifications of the A.P. Standard Specifications and other conditions and specifications of this contract.
- b) It is to be expressly understood that the measured work is to be taken net (not withstanding any custom or practice to the contrary) according to the actual quantities when in place and finished according to the drawings or as may be ordered from time to time by the Engineer-in-charge and the cost calculated by measuring or weight at the respective prices without any additional charges for any necessary or contingent works connected therewith.
- c) For all items of work which are more than 10% in excess of the quantities shown in the bill of quantities the rate payable for excess quantities beyond 10% shall be either tender rate or the SS rate for the item plus or minus the overall tender percentage whichever is less. The SS rate means the rate with in the estimate has been prepared for comparison with tenders.
- d) The rates quoted by the contractor are firm till completion of the work in all respects. No price variation of rates is allowed in case of delay in handing over of site to the contactors, if any by the department. However, corresponding extension of time will only be granted to the contactors.

SCHEDULE - A

Name of the work:- APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P.

S. No.	Quantity		Description of item	Rate	Per		Amount
1	1100.00	Cum	Forming embankment with borrowed useful soil by mechanical means with all leads and lifts including cost and conveyance of soil, pre-watering of soil at borrow area, removal of top soil, excavation of soils at borrowed area, depositing the soils, spreading soils, breaking clods, sectioning and consolidation with Vibratory Road Roller @ OMC to meet requirement of table 300-2 of MORT&H, including all hire and operational charges of T&P etc complete for finished item of work as per MORT&H specification 305 (4th revision). Payment will be made based on level for finished item of work.	Rs. 321.00	1	Cum	Rs. 3,53,100.00
2	200.00	Cum	Providing PCC 1:3:6 nominal mix for body walls, wing walls & returns Walls etc., using 40mm, 20mm & 10 mm nominal size Graded hard stone aggregate for leveling course, mechanically mixed, placed in foundation and compacted by vibration including curing for 14 days etc complete as directed by the engineer-in-charge and as per drawings & as per SS 402 of APDSS.	Rs. 5971.00	1	Cum	Rs. 11,94,200.00
3	30.00	No's	Providing weep holes in Plain cement concrete abutment, wing wall, return wall with 100 mm dia PVC pipe extending through the full width of the structures with slope of 1(V):20(H) towards drawing face complete as per drawing and technical specification Clause 1206 MORD complete finished item of work as directed by the Engineer-in-charge.	Rs. 250.00	1	No.	Rs. 7,500.00
4	6.50	Cum	Providing and laying cement concrete wearing course M 30 grade including reinforcement using 20 & 12 mm nominal size Graded hard stone aggregate for wearing course, mechanically mixed, placed and compacted by vibration including curing for 14 days etc complete as directed by the engineer-in-charge and as per drawings & as per SS 402 of APDSS.	Rs. 6528.00	1	Cum	Rs. 42,432.00

5	20.00	RM	Providing and laying reinforced cement concrete pipe of 600 mm dia NP3 for culverts on first class bedding of granular material including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head wall and parapets. Tech Specification Clause 1106 MORD.	Rs. 3662.00	1	RM	Rs. 73,240.00
6	500.00	Kg's	Supply, fabrication and erection of MS hand Rail over Bridge parapet wall and other required supporting structure of Jindal, Vizag, SAIL, Tata or any other equivalent make as directed by the engineer-in-charge including cost and conveyance of all materials, labour charges, including painting two coats with synthetic enamel paint over one coat of red Oxide paint all leads and lifts etc complete. complete finished item of work as directed by Engineer in Charge	Rs. 127.00	1	Kg	Rs. 63,500.00
7	25.00	RM	Providing and laying reinforced cement concrete pipe of 450 mm dia NP3 for culverts on first class bedding of granular material including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head wall and parapets. Tech Specification Clause 1106 MORD.	Rs. 2375.00	1	RM	Rs. 59,375.00
ESTIMATED CONTRACT VALUE							Rs. 17,93,347.00

Note: The rate shall be exclusive of GST which will be reimbursed as per applicable rates.

SCHEDULE – B**Issue Rate of material:**

Name of the Work: **APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P.**

S.No.	Description of Item	Rate	Source of Supply
1	NIL	NIL	NIL

SCHEDULE – C**LEAD STATEMENT**

Name of the Work: **APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P.**

S.No.	Description of item	Source
1	Cement	Kurnool
2	Sand	Erladinne, C.Belagal, Kurnool
3	All types of Aggregates	Thammarajupalli

Note: The above information given above is indicative only. The firm shall make his assessment regarding availability of above materials in adequate quantity and quality and the distance of the source etc., before quoting his rates and no claim will be entertained on this account afterwards.

SCHEDULE – D**LIST OF TENDER PURPOSE DRAWINGS ENCLOSED TO THIS SPECIFICATION**

Name of the Work: **APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P.**

S.No	TITLE

PARTICULARS OF TENDERER

Name of the Work: **APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P.**

Name of the Tenderer/ Contractor:

Name of the contact person responsible for the work:

Designation/ Status of the contact person:

Contact Details of the person responsible for the work:

Mobile Phone No.

Office Phone No.

Residence Phone No.

Any Other Phone No.

Present Address:

Permanent Address:

BANK GUARANTEE PROFORMA

**To,
The Managing Director,
APSPCL, Tadepalli.**

Dear Sir,

Guarantee No	:
Amount of Bank Guarantee	:
Guarantee Cover From	:
Last Date for Lodgment of Claim	:

WHEREAS _____ (hereinafter
called "the Contractor") has undertaken, in pursuance of
_____ for the work of
_____.

AND WHEREAS it has been stipulated by you in the said tender that Rs. _____ of
EMD amount shall be paid by the contractor for participating in the tender.

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on
behalf of the Contractor, up to a total of Rs. _____, such sum
being payable in the types and proportions of currencies in which the Contract Price is
payable, and we undertake to pay you, upon your first written demand and without cavil
or argument, any sum or sums within the limits of Rs. _____
(amount of Guarantee) as aforesaid without your needing to prove or to show grounds or
reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor
before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the
tender or of the Works to be performed there under or of any of the Contract documents
which may be made between you and the contractor shall in any way release us from
any liability under this guarantee and we hereby waive notice of any such change,
addition or modification.

This Guarantee will remain in force up to and including the date _____ any
demand in respect of this guarantee should reach the Bank not later than the above
date.

Not with standing anything contained herein above:

1. Our liability under this Bank Guarantee shall not exceed Rs. _____.
2. This Bank Guarantee shall be valid upto _____.
3. We are liable to pay the Guarantee amount or any part thereof under this bank guarantee only and only if the beneficiary / Govt. serves upon the Bank a written claim or demand on or before _____ (date of expiry of Guarantee).

It is in the best interest of the beneficiaries to check up the genuiness of the Guarantee with the branch you may contact us and you may confirm the guarantees through fax.

DATE:

SIGNATURE OF THE BANK

SEAL

Witness 1 :
(Name & Address)

Witness 2 :
(Name & Address)

BANK ACCOUNT MANDATE FORM

ELECTRONIC CLEARING SERVICE (CREDIT CLEARING)/REAL TIME GROSS SETTLEMENT (RTGS) FACILITY FOR RECEIVING PAYMENTS

A. DETAILS OF ACCOUNT HOLDER:

NAME OF ACCOUNT HOLDER	
COMPLETE CONTACT ADDRESS	
TELEPHONE NUMBER/FAX/E.MAIL	

B. BANK ACCOUNT DETAILS :

NAME OF THE BANK	
BRANCH NAME & ADDRESS	
WHETHER THE BRANCH IS COMPUTERISED?	
WHETHER THE BRANCH IS RTGS ENABLED ? IF YES, THEN WHAT IS THE BRANCH'S <u>IFSC CODE</u>	
IS THE BRANCH IS ALSO NEFT ENABLED ?	
TYPE OF ACCOUNT (SB/CURRENT/CASH CREDIT)	
COMPLETE BANK ACCOUNT NUMBER	

DATE OF EFFECT: _____

I hereby declare that the particulars given above are correct and complete. If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold the APSPCL responsible.

Signature of Contractor

Date:

Certified that the particulars furnished above are correct as per our records.

Signature of Banker

(Bank's Stamp)

Date:

INTEGRITY PACT

Between

Andhra Pradesh Solar Power Corporation Private Limited hereinafter referred to as "**APSPCL**",

And

..... herein after referred to as "**The Bidder / Contractor**"

The APSPCL intends to call tenders and award the work under laid down organizational procedures, contract/s for the work of "**APSPCL – LAD – KUMSP (1000 MW) – Construction of Cross-drainage and other protection works for newly formed Gravel road from Gani Sy.No 45/B to Hussenapuram - Gadivemula R&B road in Gani village of Gadivemula Mandal, Nandyal District. A.P.**"

The APSPCL and the Bidders shall value the full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness / transparency in bidding and as well as execution of contracts and both the parties shall adhere to the following.

1. Commitments of the APSPCL

- a. No employee of the APSPCL, personally or through family members, will in connection with the tender or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
- b. The APSPCL will, during the tender process treat all Bidder(s) with equity and reason. The APSPCL will in particular, before *and* during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

2. Commitments of the Bidder(s)/ contractor(s)

- a. The Bidder(s) / Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the APSPCL's employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
- b. The Bidder(s) / Contractor(s) will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
- c. The Bidder(s) / Contractor(s) will not commit any offence under the relevant IPC/PC Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the APSPCL as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

3. If the Bidder(s)/Contractor(s), before award or during execution commits a transgression through a violation of clause 2, above or in any other form such as to put his reliability or credibility in question, the APSPCL is entitled to disqualify the Bidder(s)/Contractor(s) from the tender process and exclusion in future tenders.
4. If the APSPCL disqualifies the Bidder(s) from the tender process prior to the award as per clause 3 above, the APSPCL is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.
5. If the APSPCL terminates the contract or if the APSPCL is entitled to terminate the contract according clause 3 above, the APSPCL shall be entitled to demand and recover from the contractor liquidated damages of the Contract value or the amount equivalent to Performance Guarantee.
6. The Bidder(s)/ Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact.
7. The Integrity Pact begins from the date of tender notification and expires after the contractor receives the last payment under the contract.

(For & On behalf of the APSPCL)

(Office Seal)

(For & On behalf of Bidder/ Contractor)

(Office Seal)

Place -----

Date -----

Witness 1 :
(Name & Address)

Witness 2 :
(Name & Address)

305. EMBANKMENT CONSTRUCTION

305.1. General

305.1.1. Description : These Specifications shall apply to the construction of embankments including subgrades, earthen shoulders and miscellaneous backfills with approved material obtained from roadway and drain excavation, borrow pits or other sources. All embankments, subgrades, earthen shoulders and miscellaneous backfills shall be constructed in accordance with the requirements of these Specifications and in conformity with the lines, grades, and cross-sections shown on the drawings or as directed by the Engineer.

305.2. Materials and General Requirements

305.2.1. Physical requirements:

305.2.1.1. The materials used in embankments, subgrades, earthen shoulders and miscellaneous backfills shall be soil, moorum, gravel, a mixture of these or any other material approved by the Engineer. Such materials shall be free of logs, stumps, roots, rubbish or any other ingredient likely to deteriorate or affect the stability of the embankment/ subgrade.

The following types of material shall be considered unsuitable for embankment:

- (a) Materials from swamps, marshes and bogs;
- (b) Peat, tog, stump and perishable material; any soil that classifies as OL, OI, OH or Pt in accordance with IS : 1498;
- (c) Materials susceptible to spontaneous combustion;
- (d) Materials in a frozen condition;
- (e) Clay having liquid limit exceeding 70 and plasticity index exceeding 45: and
- (f) Materials with salts resulting in leaching in the embankment.

305.2.1.2. Expansive clay exhibiting marked swell and shrinkage properties ("free swelling index" exceeding 50 per cent when tested as per IS: 2720 - Part 40) shall not be used as a fill material. Where an expansive clay with acceptable "free swelling index" value is used as a fill material, subgrade and top 500 mm portion of the embankment just below subgrade shall be non-expansive in nature.

305.2.1.3. Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as SO_3) per litre when tested in accordance with BS : 1377 Test 10, but using a 2:1 water-soil ratio shall not be deposited within 500 mm or other distance described in the Contract, of concrete, cement bound materials or other cementitious materials forming part of the Permanent Works.

Materials with a total sulphate content (expressed as SO_3) exceeding 0.5 per cent by mass, when tested in accordance with BS : 1377 Test 9 shall not be deposited within 500 mm, or other distances described in the Contract, of metallic items forming part of the Permanent Works.

305.2.1.4. The size of the coarse material in the mixture of earth shall ordinarily not exceed 75 mm when being placed in the embankment and 50 mm when placed in the subgrade. However, the Engineer may at his discretion permit the use of material coarser

than this also if he is satisfied that the same will not present any difficulty as regards the placement of fill material and its compaction to the requirements of these Specifications. The maximum particle size shall not be more than two-thirds of the compacted layer thickness.

305.2.1.5. Ordinarily, only the materials satisfying the density requirements given in Table 300-1 shall be employed for the construction of the embankment and the subgrade.

TABLE 300-1. DENSITY REQUIREMENTS OF EMBANKMENT AND SUBGRADE MATERIALS

S. No.	Type of Work	Maximum laboratory dry unit weight when tested as per IS: 2720 (Part 8)
1.	Embankments up to 3 metres height, not subjected to extensive flooding.	Not less than 15.2 kN/cu.m.
2.	Embankments exceeding 3 metres height or embankments of any height subject to long periods of inundation	Not less than 16.0 kN/cu.m.
3.	Subgrade and earthen shoulders/verges/backfill	Not less than 17.5 kN/cu.m.

- Notes: (1) This Table is not applicable for lightweight fill material e.g. cinder, fly ash etc.
 (2) The Engineer may relax these requirements at his discretion taking into account the availability of materials for construction and other relevant factors.
 (3) The material to be used in subgrade should also satisfy design CBR at the dry unit weight applicable as per Table 300-2.

305.2.2. General requirements :

305.2.2.1. The materials for embankment shall be obtained from approved sources with preference given to materials becoming available from nearby roadway excavation or any other excavation under the same.

The work shall be so planned and executed that the best available materials are saved for the subgrade and the embankment portion just below the subgrade.

305.2.2.2. Borrow materials : Where the materials are to be obtained from designated borrow areas, the location, size and shape of these areas shall be as indicated by the Engineer and the same shall not be opened without his written permission. Where specific borrow areas are not designated by the Employer/the Engineer, arrangement for locating the source of supply of material for embankment and subgrade as well as compliance to environmental requirements in respect of excavation and borrow areas as stipulated, from time to time by the Ministry of Environment and Forests, Government of India and the local bodies, as applicable, shall be the sole responsibility of the Contractor.

Borrowpits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. Ridges of not less than 8 m width should be left at intervals not exceeding 300 m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth in any case being limited to 1.5 m. Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10 m.

Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plant is operating at the place of deposition.

No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Should the Contractor be permitted to remove acceptable material from the site to suit his operational procedure, then he shall make good any consequent deficit of material arising therefrom.

Where the excavation reveals a combination of acceptable and unacceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the unacceptable materials. The acceptable materials shall be stockpiled separately.

The Contractor shall ensure that he does not adversely affect the Stability of excavation or fills by the methods of stockpiling materials, IBC of plants or siting of temporary buildings or structures.

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme approved by the Engineer. It shall be ensured that the subgrade material when compacted to the density requirements as in Table 300-2 shall yield the design CBR value of the subgrade.

TABLE 300-2. COMPACTION REQUIREMENTS FOR EMBANKMENT AND SUBGRADE

Type of work/ material	Relative compaction as percentage of max. laboratory dry density as per IS: 2720 (Part 8)
1. Subgrade and earthen shoulders	Not less than 97
2. Embankment	Not less than 95
3. Expansive Clays	
a) Subgrade and 500 mm portion just below the subgrade	Not allowed
b) Remaining portion of embankment	Not less than 90

The Contractor shall at least 7 working days before commencement of compaction submit the following to the Engineer for approval:

- (i) The value of maximum dry density and optimum moisture content obtained in accordance with IS: 2720 (Part 7) or (Part 8), as the case may be, appropriate for each of the fill materials he intends to use.
- (ii) A graph of density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture

- content were determined.
- (iii) The Dry density-moisture content -CBR relationships for light, intermediate and heavy compactive efforts (light corresponding to IS: 2720 (Part 7), heavy corresponding to IS: 2720 (Part 8) and intermediate in-between the two) for each of the fill materials he intends to use in the subgrade.

Once the above information has been approved by the Engineer, it shall form the basis for compaction.

305.3. Construction Operations

305.3.1. Setting out : After the site has been cleared to Clause 201, the work shall be set out to Clause 301.3.1. The limits of embankment/subgrade shall be marked by fixing batter pegs on both at regular intervals as guides before commencing the earthwork, embankment/subgrade shall be built sufficiently wider than the design dimension so that surplus material may be trimmed, ensuring that the remaining material is to the desired density and in position specified and conforms to the specified side slopes.

305.3.2. Dewatering : If the foundation of the embankment is in an area with stagnant water, and in the opinion of the Engineer it is feasible to remove it, the same shall be removed by bailing out or pumping, as directed by the Engineer and the area of the embankment foundation shall be kept dry. Care shall be taken to discharge the drained water so as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair/restore it to original condition or compensate the damage at his own cost.

If the embankment is to be constructed under water, Clause 305.4.6 shall apply.

305.3.3. Stripping and storing topsoil : In localities where most of the available embankment materials are not conducive to plant growth, or when so directed by the Engineer, the topsoil from all areas of cutting and from all areas to be covered by embankment foundation shall be stripped to specified depths not exceeding 150 mm and stored in stockpiles of height not exceeding 2 m for covering embankment slopes, cut slopes and other disturbed areas where re-vegetation is desired. Topsoil shall not be unnecessarily trafficked either before stripping or when in a stockpile. Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum.

305.3.4. Compacting ground supporting embankment/subgrade: Where necessary, the original ground shall be levelled to facilitate placement of first layer of embankment, scarified, mixed with water and then compacted by rolling so as to achieve minimum dry density as given in Table 300-2.

In case where the difference between the subgrade level (top of the subgrade on which pavement rests) and ground level is less than 0.5 m and the ground does not have 97 per cent relative compaction with respect to the dry density as given in Table 300-2, the ground shall be loosened upto a level 0.5 m below the subgrade level, watered and compacted in layers in accordance with Clauses 305.3.5 and 305.3.6 to not less than 97 per cent of dry density as given in Table 300-2.

Where so directed by the Engineer, any unsuitable material occurring in the embankment foundation shall be removed and replaced by approved materials laid in layers to the required degree of compaction.

Embankment or subgrade work shall not proceed until the foundations for embankment/subgrade have been inspected by the Engineer for satisfactory condition and approved.

Any foundation treatment specified for embankments especially high embankments, resting on suspect foundations as revealed by borehole logs shall be carried out in a manner and to the depth as desired by the Engineer. Where the ground on which an embankment is to be built has any of the material types (a) to (f) in Clause 305.2.1, at least 500 mm of such material must be removed and replaced by acceptable fill material before embankment construction commences.

305.3.5. Spreading material in layers and bringing to appropriate moisture content

305.3.5.1. The embankment and subgrade material shall be spread in layers of uniform thickness not exceeding 200 mm compacted thickness over the entire width of embankment by mechanical means, finished by a motor grader and compacted as per Clause 305.3.6. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the specific slope and grade. Successive layers shall not be placed until the layer under construction has been thoroughly compacted to the specified requirements as in Table 300-2 and got approved by the Engineer. Each compacted layer shall be finished parallel to the final cross-section of the embankment.

305.3.5.2. Moisture content of the material shall be checked at the site of placement prior to commencement of compaction; if found to be out of agreed limits, the same shall be made good. Where water is required to be added in such constructions, water shall be sprinkled from a water tanker fitted with sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surface but without any flooding. The water shall be added uniformly and thoroughly mixed in soil by blading, discing or harrowing until a uniform moisture content is obtained throughout the depth of the layer.

If the material delivered to the roadbed is too wet, it shall be dried, by aeration and exposure to the sun, till the moisture content is acceptable for compaction. Should circumstances arise, where owing to wet weather, the moisture content cannot be reduced to the required amount by the above procedure, compaction work shall be suspended.

Moisture content of each layer of soil shall be checked in accordance with IS: 2720 (Part 2), and unless otherwise mentioned, shall be so adjusted, making due allowance for evaporation losses, that at the time of compaction it is in the range of 1 per cent above to 2 per cent below the optimum moisture content determined in accordance with IS:2720 (Part 7) or IS:2720 (Part 8) as the case may be. Expansive clays shall however, be compacted at moisture content corresponding to the specified dry density, but on the wet side of the optimum moisture content obtained from the laboratory compaction curve.

After adding the required amount of water, the soil shall be processed by means of graders, harrows, rotary mixers or as otherwise approved by the Engineer until the layer is uniformly wet.

Clods or hard lumps of earth shall be broken to have a maximum size of 75 mm when being placed in the embankment and a maximum size of 50 mm when being placed in the subgrade.

305.3.5.3. Embankment and other areas of fill shall, unless otherwise required in the Contract or permitted by the Engineer, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct construction plant and other vehicular traffic uniformly over them. Damage by construction plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength as the material had before it was damaged.

Embankments and other areas of unsupported fills shall not be constructed with steeper side slopes, or to greater widths than those shown in the Contract, except to permit adequate compaction at the edges before trimming back, or to obtain the final profile following any settlement of the fill and the underlying material.

Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including embankments, cuttings, other fills and excavations steeper than 1 vertical on 4 horizontal, such faces shall be benched as per Clause 305.4.1 immediately before placing the subsequent fill.

All permanent faces of side slopes of embankments and other areas of fill formed shall, subsequent to any trimming operations, be reworked and sealed to the satisfaction of the Engineer by tracking a tracked vehicle, considered suitable by the Engineer, on the slope or any other method approved by the Engineer.

305.3.6. Compaction : Only the compaction equipment approved by the Engineer shall be employed to compact the different material types encountered during construction. Smooth wheeled, vibratory, pneumatic tyred, sheepsfoot or pad foot rollers, etc. of suitable size and capacity as approved by the Engineer shall be used for the different types and grades of materials required to be compacted either individually or in suitable combinations.

The compaction shall be done with the help of vibratory roller of 80 to 100 kN static weight with plain or pad foot drum or heavy pneumatic tyred roller of adequate capacity capable of achieving required compaction.

The Contractor shall demonstrate the efficacy of the equipment he intends to use by carrying out compaction trials. The procedure to be adopted for these site trials shall first be submitted to the Engineer for approval.

Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account.

Each layer of the material shall be thoroughly compacted to the densities specified in Table 300-2. Subsequent layers shall be placed only after the finished layer has been tested according to Clause 903.2.2 and accepted by the Engineer. The Engineer may permit measurement of field dry density by a nuclear moisture/density gauge used in accordance with agreed procedure and the gauge is calibrated to provide results identical to that obtained from tests in accordance with IS: 2720 (Part 28). A record of the same shall be maintained by the Contractor.

When density measurements reveal any soft areas in the embankment/subgrade/earthen shoulders, further compaction shall be carried out as directed by the Engineer. If inspite of that the specified compaction is not achieved, the material in the soft areas shall be removed and replaced by approved material, compacted to the density requirements and satisfaction of the Engineer.

305.3.7. Drainage : The surface of the embankment/subgrade at all times during construction shall be maintained at such a cross fall (not flatter than that required for effective drainage of an earthen surface) as will shed water and prevent ponding.

305.3.8. Repairing of damages caused by rain/spillage of water: The soil in the affected portion shall be removed in such areas as directed by the Engineer before next layer is laid and refilled in layers and compacted using appropriate mechanical means such as small vibratory roller, plate compactor or power rammer to achieve the required density in accordance with Clause 305.3.6. If the cut is not sufficiently wide for use of required mechanical means for compaction the same shall be widened suitably to permit their use for proper compaction. Tests shall be carried out as directed by the Engineer to ascertain the density requirements of the repaired area. The work of repairing the damages including widening of the cut, if any, shall be carried out by the Contractor at his own cost, including the arranging of machinery/equipment for the purpose.

305.3.9. Finishing operations : Finishing operations shall include the work of shaping and dressing the shoulders/verge/roadbed and side slopes to conform to the alignment, levels, cross-sections and dimensions shown on the drawings or as directed by the Engineer subject to the surface tolerance described in Clause 902. Both the upper and lower ends of the side slopes shall be rounded off to improve appearance and to merge the embankment with the adjacent terrain.

The topsoil, removed and conserved carrier (Clause 301.3.2 and 305.3.3) shall be spread over the fill slopes as per directions of the Engineer to facilitate the growth of vegetation. Slopes shall be roughened and moistened slightly prior to the application of the topsoil in order to provide satisfactory bond. The depth of the topsoil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 150 mm.

Where directed, the slopes shall be turfed with sods in accordance with Clause 307. If seeding and mulching of slopes is prescribed, this shall be done to the requirement of Clause 308.

When earthwork operations have been substantially completed, the road area shall be cleared of all debris, and ugly scars in the construction area responsible for objectionable appearance eliminated.

305.4. Construction of Embankment and Subgrade under Special Conditions

305.4.1. Earthwork for widening existing road embankment: When an existing embankment and/or subgrade is to be widened and its slopes are steeper than 1 vertical on 4 horizontal, continuous horizontal benches, each at least 300 mm wide, shall be cut into the old slope for ensuring adequate bond with the fresh embankment/subgrade material to be added. The material obtained from cutting of benches could be utilized in the widening of the embankment/subgrade. However, when the existing slope against which the fresh material is to be placed is flatter than 1 vertical on 4 horizontal, the slope surface may only be ploughed or scarified instead of resorting to benching.

Where the width of the widened portions is insufficient to permit the use of conventional rollers, compaction shall be carried out with the help of small vibratory rollers/plate compactors/power rammers or any other appropriate equipment approved by the Engineer. End dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other types of hauling equipment.

305.4.2. Earthwork for embankment and subgrade to be placed against sloping ground : Where an embankment/subgrade is to be placed against sloping ground, the latter shall be appropriately benched or ploughed/scarified as required in Clause 305.4.1 before placing the embankment/subgrade material. Extra earthwork involved in benching or due to ploughing/scarifying etc. shall be considered incidental to the work.

For wet conditions, benches with slightly inward fall and subsoil drains at the lowest point shall be provided as per the drawings, before the fill is placed against sloping ground.

Where the Contract requires construction of transverse subsurface drain at the cut-fill interface, work on the same shall be carried out to s 309 in proper sequence with the embankment and subgrade work; approved by the Engineer.

305.4.3. Earthwork over existing road surface : Where the embankment is to be placed over an existing road surface, the work shall be carried out as indicated below :

- (i) If the existing road surface is of granular or bituminous type and lies within 1 m of the new subgrade level, the same shall be scarified to a depth of 50 mm or more if specified, so as to provide ample bond between the old and new material ensuring that at least 500 mm portion below the top of new subgrade level is compacted to the desired density.
- (ii) If the existing road surface is of cement concrete type and lies within 1m of the new subgrade level the same shall be removed completely.
- (iii) If the level difference between the existing road surface and the new formation level is more than 1m, the existing surface shall be permitted to stay in place without any modification.

305.4.4. Embankment and subgrade around structures : To avoid interference with the construction of abutments, wing walls or return walls of culvert/bridge structures, the Contractor shall, at points to be determined by the Engineer suspend work on embankment forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of damage to the structure.

Unless directed otherwise, the filling around culverts, bridges and other structures upto a distance of twice the height of the road from the back of the abutment shall be carried out independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall, unless permission has been given by the Engineer but in any case not until the concrete or masonry has been in position for 14 days. The embankment and subgrade shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer.

The material used for backfill shall not be an organic soil or highly plastic clay having plasticity index and liquid limit more than 20 and 40 respectively when tested according to IS : 2720 (Part 5). Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in Appendix 6 of IRC:78 (Standard Specifications and Code of Practice for Road Bridges-Section VII) in respect of the type of material, the extent of backfill, its laying and compaction etc. The fill material shall be deposited in horizontal layers in loose thickness and compacted thoroughly to the requirements of Table 300-2.

Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material

used for filter shall conform to the requirements for filter medium spelt out in Clause 2502/309.3.2 (B) unless otherwise specified in the Contract.

Where it may be impracticable to use conventional rollers, the compaction shall be carried out by appropriate mechanical means such as small vibratory roller, plate compactor or power rammer. Care shall be taken to see that the compaction equipment does not hit or come too close to any structural member so as to cause any damage to them or excessive pressure against the structure.

305.4.5. Construction of embankment over ground incapable of supporting construction equipment : Where embankment is to be constructed across ground which will not support the weight of repeated heavy loads of construction equipment the first layer of the fill may be constructed by placing successive loads of material in a uniformly distributed layer of a minimum thickness required to support the construction equipment as permitted by the Engineer. The Contractor, if so desired by him, may also use suitable geosynthetic material to increase the bearing capacity of the foundation. This exception to normal procedure will not be permitted where, in the opinion of the Engineer, the embankments could be constructed in the approved manner over such ground by the use of lighter or modified equipment after proper ditching and drainage have been provided. Where this exception is permitted, the selection of the material and the construction procedure to obtain an acceptable layer shall be the responsibility of the Contractor. The cost of providing suitable traffic conditions for construction equipment over any area of the Contract will be the responsibility of the Contractor and no extra payment will be made to him. The remainder of the embankment shall be constructed as specified in Clause 305.3.

305.4.6. Embankment construction underwater : Where filling : or backfilling is to be placed under water, only acceptable granular material or rock shall be used unless otherwise approved by the Engineer. Acceptable granular material shall consist of graded, hard durable particles with maximum particle size not exceeding 75 mm. The material should be non-plastic having uniformity coefficient of not less than 10. The material placed in open water shall be deposited by end tipping without compaction.

305.4.7. Earthwork for high embankment : In the case of high embankments, the Contractor shall normally use the material the specified borrow area. In case he desires to use different for his own convenience, he shall have to carry out necessary investigations and redesign the high embankment at his own cost. Contractor shall then furnish the soil test data and design of high embankment for approval of the Engineer, who reserves the right to accept or reject it.

If necessary, stage construction of fills and any controlled rates; shall be carried out in accordance with the Contract including of instruments and its monitoring.

Where required, the Contractor shall surcharge embankments or other of fill with approved material for the periods specified in the ct If settlement of surcharged fill results in any surcharging material, which is unacceptable for use in the fill being surcharged, lying below formation level, the Contractor shall remove the unacceptable material and dispose it as per direction of the Engineer. He shall then bring the resultant level up to formation level with acceptable material.

305.4.8. Settlement period : Where settlement period is specified in the Contract, the embankment shall remain in place for the required settlement period before

excavating for abutment, wingwall, retaining wall, footings, etc., or driving foundation piles. The duration of the required settlement period at each location shall be as provided for in the Contract or as directed by the Engineer.

305.5. Plying of Traffic

Construction and other vehicular traffic shall not use the prepared surface of the embankment and/or subgrade without the prior permission of the Engineer. Any damage arising out of such use shall, however, be made good by the Contractor at his own expense as directed by the Engineer.

305.6. Surface Finish and Quality Control of Work

The surface finish of construction of subgrade shall conform to the requirements of Clause 902. Control on the quality of materials and works shall be exercised in accordance with Clause 903.

305.7. Subgrade Strength

305.7.1. It shall be ensured prior to actual execution that the borrow area material to be used in the subgrade satisfies the requirements of design CBR.

305.7.2. Subgrade shall be compacted and finished to the design strength consistent with other physical requirements. The actual laboratory CBR values of constructed subgrade shall be determined on undisturbed samples cut out from the compacted subgrade in CBR mould fitted with cutting shoe or on remoulded samples, compacted to the field density at the field moisture content.

305.8. Measurements for Payment

Earth embankment/subgrade construction shall be measured separately by taking cross sections at intervals in the original position before the work starts and after its completion and computing the volumes of earthwork in cubic metres by the method of average end areas.

The measurement of fill material from borrow areas shall be the difference between the net quantities of compacted fill and the net of suitable material brought from roadway and drainage excavation. For this purpose, it shall be assumed that one cu.m. of suitable material brought to site from road and drainage excavation forms one cu.m. of compacted fill and all bulking or shrinkage shall be ignored.

Construction of embankment under water shall be measured in cu.m.

Construction of high embankment with specified material and in specified manner shall be measured in cu.m.

Stripping including storing and reapplication of topsoil shall be measure cu.m.

Work involving loosening and recompacting of ground supporting embankment/subgrade shall be measured in cu. m.

Removal of unsuitable material at embankment/subgrade foundation and replacement with suitable material shall be measured in cu.m.

Scarifying existing granular/bituminous road surface shall be measured in square metres.

Dismantling and removal of existing cement concrete pavement shall be measured vide Clause 202.6.

Filter medium and backfill material behind abutments, wing walls Other retaining structures shall be measured as finished work in position in cu.m.

305.9. Rates

305.9.1. The Contract unit rates for the items of embankment and construction shall be payment in full for carrying out the operations including full compensation for:

- (i) Cost of arrangement of land as a source of supply of material of required quantity for construction unless provided otherwise in the Contract;
- (ii) Selling out;
- (iii) Compacting ground supporting embankment/subgrade except where removal and replacement of unsuitable material or loosening and recompact is involved;
- (iv) Scarifying or cutting continuous horizontal benches 300 mm wide on side slopes of existing embankment and subgrade as applicable;
- (v) Cost of watering or drying of material in borrow areas and/or embankment and subgrade during construction as required;
- (vi) Spreading in layers, bringing to appropriate moisture content and compacting to Specification requirements;
- (vii) Shaping and dressing top and slopes of the embankment and subgrade including rounding of comers;
- (viii) Restricted working at sites of structures;
- (ix) Working on narrow width of embankment and subgrade;
- (x) Excavation in all soils from borrow pits/designated borrow areas including clearing and grubbing and transporting the material to embankment and subgrade site with all lifts and leads unless otherwise provided for in the Contract;
- (xi) All labour, materials, tools, equipment and incidentals necessary to complete the work to the Specifications;
- (xii) Dewatering; and
- (xiii) Keeping the embankment/completed formation free of water as per Clause 311.

305.9.2. In case the Contract unit rate specified is not inclusive of all leads, the unit rate for transporting material beyond the initial lead, as specified in the Contract for construction of embankment and subgrade shall be inclusive of full compensation for all labour, equipment, tools and incidentals necessary on account of the additional haul or transportation involved beyond the specified initial lead.

305.9.3. Clause 301.9.5 shall apply as regards Contract unit rates for items of stripping and storing top soil and of reapplication of topsoil.

305.9.4. Clause 301.9.2 shall apply as regards Contract unit rate for the item of loosening and recompact the embankment/subgrade foundation.

305.9.5. Clauses 301.9.1 and 305.8 shall apply as regards Contract rates for items of removal of unsuitable material and replacement with suitable material respectively.

305.9.6. The Contract unit rate for scarifying existing granular/bituminous road surface shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals necessary to complete the work. This will also comprise of handling, salvaging, stacking and disposing of the dismantled materials within all lifts and upto a lead of 1000 m or as otherwise specified.

305.9.7. Clause 202.7 shall apply as regards Contract unit rate for dismantling and removal of existing cement concrete pavement.

305.9.8. The Contract unit rate for providing and laying filter material behind abutments shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to specifications.

305.9.9. Clause 305.4.6 shall apply as regards Contract unit rate for construction of embankment under water.

305.9.10. Clause 305.4.7 shall apply as regards Contract unit rate for construction of high embankment. It shall include cost of instrumentation, its monitoring and settlement period, where specified in the Contract or directed by the Engineer.

Specification No. 402

Cement concrete for Plain and Reinforced work

402.1. Terminology :

402.1.1. *Controlled Concrete* :—Concrete for which the mix has been proportioned on the basis of trial mix based on preliminary tests.

402.1.2. *Ordinary Concrete* :—Concrete for which a nominal mix has been used without preliminary tests.

402.1.3. *Preliminary test* :— A test conducted in a laboratory on a trial mix with the object of designing a concrete mix before actual concreting operations or for determining the necessary adjustments during execution.

402.1.4. *Works test* :— A test conducted either on the field or in a laboratory on specimens made on the site out of concrete being used on the works.

402.1.5. *Proportioning* :— The determination of the mutual proportions of cement, aggregates, water and admixtures if any required to attain the desired workability, strength and any other special characteristics.

402.1.6. *Grade of Concrete* :— The letter M (Standing for 'mix') followed by a number indicating the specified 28-day works cube compressive strength of the mix expressed in Kg/cu.m².

402.2. Materials :

402.2.1. *Coarse aggregate* :—The aggregate of specified maximum size shall be graded and shall comply with SS : 108.

402.2.2. *Sand* :—This shall conform to SS : 110.

402.2.3. *Cement* :—Cement to be used, shall conform to the SS : 112.

402.2.4. *Water* :—Water used for both mixing and curing shall be fresh, clean and free from injurious amounts of deleterious materials. Potable waters are generally considered satisfactory for mixing and curing concrete.

402.2.5. *Admixtures* :—When specified only approved admixtures shall be used strictly in accordance with the Executive Engineer's instructions. Calcium chloride shall not be used for reinforced concrete.

402.3. *Grades of Concrete* :—The concrete shall be of seven grades designated as M 100, M 150, M 200, M 250, M 300, M 350 and M 400.

402.4. Strength Requirements of concrete :

402.4.1. Where ordinary portland cement conforming to SS : 112 is used the 28-day compressive strength requirements for various grades of concrete shall be as given in Table 402-A.

Table 402-A
Strength requirements of concrete (All values in Kg./cm²)

<i>Grades of Concrete</i>	<i>Compressive strength of 150mm. cubes at 28 days after mixing</i>	
	<i>Preliminary test (minimum)</i>	<i>Works test (minimum)</i>
M 100	135	100
M 150	200	150
M 200	260	200
M 250	320	250
M 300	380	300
M 350	440	350
M 400	500	400

Where rapid hardening portland cement is used the specified strength shall be attained at 7 days instead of at 28 days. Where other cements are used the Executive Engineer shall specify the corresponding requirements, preferably on the basis of preliminary tests.

402.4.2. The strength requirements specified in Table 402-A shall apply to both controlled and ordinary concrete. Preliminary tests need not however to be made in the case of ordinary concrete.

402.4.3. In order to get a relatively quicker idea of the quality of concrete optional works tests on beams for modulus of rupture at 72±2 hours or at 7 days, or compressive strength tests at 7 days may be carried out in addition to 28-day compressive strength tests. In all cases a 28-day compressive strength specified in Table 402-A shall alone be the criterion for acceptance or rejection of the concrete. If however, from tests carried in a particular job over a reasonably long period it has been established to the satisfaction of the Executive Engineer that a suitable ratio is got between the 28-day compressive strength and the modulus of rupture at 72 plus or minus 2 hours or 7 days or compressive strength at 7 days then in such cases compression strength at 7 days may be accepted. The Executive Engineer may suitably relax the frequency of 28-day compressive strength tests specified in Table 402-D provided the expected strength values at the specified early age are consistently met. For this purpose the values given in Table 402-B may be taken for general guidance in the case of concrete made with the ordinary portland cement.

Table 402-B

Optional works test requirements of concrete, (All values in kg./cm.)
(All tests conducted in accordance with IS : 516-1959)

Grade of concrete	Compressive strength on 150mm. cubes at 7 days Minimum	Modulus of ruptures by Beams test, Minimum	
		at 72 plus or minus 2 hrs.	at 7 days
M 100	70	12	17
M 150	100	15	21
M 200	135	17	24
M 250	170	19	27
M 300	200	21	30
M 350	235	23	32
M 400	270	25	34

402.4.4. Where the strength of a concrete mix as indicated by tests lies in between the strength for any two grades specified in Table 402-A, such concrete shall be classified for all purposes as a concrete belonging to the lower of the two grades between which its strength lies.

402.5. Proportioning and works control :

402.5.1. Controlled concrete :—As far as possible controlled concrete shall be used on all concrete works requiring a concrete of grade higher than M 200. Controlled concrete for use in plain and reinforced concrete shall be of grade M 100, M 150, M 200, M 250, M 300, M 350 and M 400.

402.5.1.1. The concrete mix shall be designed to have an average strength corresponding to the values specified for preliminary tests in Table 402-A. The proportions chosen shall be such that the concrete is of adequate workability for the conditions prevailing in the work in question and can be properly compacted with the means available. The maximum total quantity of aggregate by weight per 50kg. of cement shall not exceed 450kg. except where otherwise specifically permitted by the Executive Engineer.

402.5.1.2. Except where it can be shown to the satisfaction of the Executive Engineer, that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the proper proportions when required. The different sizes shall be stacked in separate stock piles. The materials shall be stock piled preferably one week before use. The grading of coarse and fine aggregates shall be checked as frequently as possible the frequency for a given job being determined by the Executive Engineer to ensure that the suppliers are maintaining the grading in conformity with that of the samples used in the preliminary test.

402.5.1.3. In proportioning concrete the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the manufacturer's weight per bag a reasonable number of bags shall be weighed separately to check the net weight. When loose cement is weighted at the site it shall be weighed separately from the aggregates. Water shall be either measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in a clean serviceable condition and their accuracy periodically checked.

402.5.1.4. It is most important to maintain the water cement ratio constant at its correct value. To this end determination of moisture content of both fine and coarse aggregates shall be made as frequently as possible, the frequency for a given job being determined by the Executive Engineer according to the weather conditions. The amount of the water added shall be adjusted to compensate for any observed variations in the moisture content. The moisture content in the aggregates shall be determined as specified in IS : 2386 (Part-III)-1963. To allow for the variation in weight of aggregates due to variation in their moisture contents suitable adjustments in the weights of aggregates shall also be made.

402.5.1.5. No substitution in materials used on the work or alterations in the established proportions except as permitted in clause 402.5.1.4. shall be made without additional tests to show that the quality and strength of concrete are satisfactory.

402.5.1.6. Workability of concrete shall be checked at frequent intervals. The slump test as described under clause 402.9.1 may be adopted for this purpose. Table 402-C gives suitable slumps for various conditions.

Table 402-C

Sl. No.	Type of work	Slumps	
		when vibrators are used	when vibrators are not used
A. Plain Concrete.			
1.	Mass concrete in foundations, footings, retaining walls and pavements, etc.	10mm. to 25mm	50mm. to 75mm.
2.	Sections less than 75mm. thickness.	25mm. to 40mm.	75mm. to 100mm.
B. Reinforced Concrete.			
1.	Mass concrete in foundations, footings and retaining walls, etc.	10mm. to 25mm.	75mm. to 100mm.
2.	Beams, slabs and columns etc., with normal amounts of reinforcement.	25mm. to 40mm.	100mm. to 125mm.
3.	Thin sections or section with congested reinforcement.	40mm. to 50mm.	125mm. to 150mm.

402.5.2. *Ordinary Concrete* :—When the use of controlled concrete is not considered practicable ordinary concrete may be used. The use of ordinary concrete shall however be restricted to grades M100, M150 and M200. The proportions for ordinary concrete shall be in accordance with Table 402-D.

Table 402-D
(Concrete mix Proportions)
Ordinary Concrete

Grade of concrete (1)	Maximum total quantity of dry aggregates by volume per 50kg. of cement to be taken as the sum of the individual volumes of fine and coarse aggregate Litres (2)	Proportion of fine aggregate to coarse aggregate (3)	Maximum quantity of water per 50kg. cement Litres (4)
M 100	300	Generally (1 : 2) for fine aggregate to coarse aggregate by volume but subject to an upper limit of (1 : 1½) and a lower limit of (1 : 3)	34
M 150	220		32
M 200	160		30

402.5.2.1. The proportions of the aggregates shall be adjusted from upper limits to lower limits progressively as the grading of the fine aggregate becomes finer and the maximum size of coarse aggregate becomes larger. *Example* : For an average grading of fine aggregate the proportions shall be (1 : 1½), (1 : 2) and (1 : 3) for the maximum aggregate size of 10mm., 20mm. and 40mm. respectively.

402.5.2.2. M100, M150 and M200 of ordinary concrete correspond approximately to (1 : 3 : 6), (1 : 2 : 4), and (1 : 1½ : 3) nominal mixes currently used in the country.

402.5.2.3. In proportioning concrete the quantity of cement shall be determined by weight. The quantities of fine and coarse aggregates may be determined by Volume but these shall also preferably be determined by weight. In the later case the weight shall be determined from the volume specified in Table 402-D and the weight per litre of the proportioned by aggregates. If the aggregate is moist and volume batch is adopted allowance shall be made for bulking which shall be determined as follows: In a 250ml. measuring cylinder pour the damp sand and consolidate it dry shaking until it reaches the 200ml. mark. Then fill the cylinder with water and stir the sand well. The water shall be sufficient to submerge the sand completely. It may be seen that the sand surface is now below its original levels. Suppose the surface is at the mark 'Y' ml. The percentage of bulking of the sand due to moisture shall be calculated from the formula.

$$\text{Percentage bulking} = (200/y - 1) \times 100$$

402.5.2.3.1. The water cement ratios shall not be more than those specified in Table 402-D. Excess water reduces the strength of concrete and shall be avoided. The quantity required shall be carefully observed from time to time and reliable data worked out for guidance as the work proceeds. The cement content of the mix specified in Table 402-D for any nominal mix may be increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction, so that the water cement ratio specified in Table 402-D is not exceeded.

402.5.2.3.2. In the case of vibrated concrete, the limit specified may be suitably reduced to avoid segregation.

402.5.2.3.3. The quantity of water used in the concrete mix for reinforced concrete work shall be just sufficient to produce a dense concrete of adequate workability which will surround and properly grip all the reinforcement. Workability of concrete shall be controlled by maintaining a water cement ratio that is found to give a concrete which by just sufficiently wet to be placed and compacted without difficulty with the means available.

402.5.2.4. Workability shall be controlled by direct measurement of water content with due allowance for any surface moisture in the coarse and fine aggregates. Clause 402.9.1 and Table 402-E give details of the slump test and recommended slumps for various conditions.

402.5.2.5. Allowances shall be made for surface water present in the aggregate when computing the water content. Surface water shall be determined by one of the field methods described in IS : 2386 (Part III)-1963. In the absence of exact data in the amount of surface water may be estimated from the values given in Table 402-F.

Table 402-F

Surface water carried by average aggregate

Aggregate	Approximate quantity of surface water (litres per cubic meter)
Very wet sand	120
Moderately wet sand	80
Moist sand	40
*Moist gravel or crushed rock	20 to 40

**Coarser the aggregate, less the water it will carry.*

402.5.2.6. If ordinary concrete made in accordance with the proportions given for a particular grade does not yield the specified strength due to proper quantities of materials not being available such concrete shall be classified as belonging to the appropriate lower grade. Ordinary concrete proportioned for a given grade in accordance with Table 402-D, shall not however be placed in a higher grade on the ground that the test strengths are higher than the minimum specified. No such interpolations shall be permitted.

402.6. Mixing :

402.6.1. Machine mixing :—Concrete shall normally be mixed in a mechanical mixer. Mixing shall be continued until there is a uniform distribution of materials and the mass is uniform in colour and consistency, but in no case shall the mixing be done for less than 2 minutes after all the materials are in the drum. When the mixing drum is charged by power loader all the mixing water shall be introduced into the drum before the soiled materials. The skip shall be loaded with about one half of the coarse aggregate, then with the fine aggregate, then with the cement and finally with the remaining coarse aggregate on top (if all-in-aggregate is used, the skip shall be loaded first with about one-half of the aggregate, then with the cement and finally with the remaining aggregate on top). Where the mixing drum is manually charged it shall be charged with the dry materials in a similar manner and the water shall be added immediately before the rotation of the drum is started.

402.6.2. Hand Mixing :—When hand mixing is permitted by the Executive Engineer it shall be carried out on a water tight, non-absorbent platform with a shovel, trowel or a similar suitable implement. Care shall be taken to ensure that the mixing is continued until the mass is uniform in colour and consistency. The platform shall be large enough to enable atleast two batches to be mixed simultaneously. The following procedure shall be adopted while mixing.

(a) The cement and fine aggregate in the specified proportions shall be mixed dry until the mixture is thoroughly blended and is uniform in colour, with no pockets of sand or cement.

(b) As much quantity of coarse aggregate as can be mixed and laid within 15 minutes after water is added to the mixture shall then be laid on the dry platform and the required quantity of cement-sand mixture shall be spread over it. The whole mass shall then be mixed turning over atleast three times while adding the required quantity of water with a sprinkling can.

402.7. Placing and Compacting :

402.7.1. Transporting :—The concrete shall be handled from the place of mixing to the place of final deposit as rapidly as practicable by methods which will prevent the segregation or loss of any of the ingredients. If segregation does occur during transportation the concrete shall be remixed before being placed.

402.7.1.1. Temperature control :—During hot or cold weather concrete shall be transported in deep containers which on account of their lower ratio of surface area to mass reduce the rate of loss of water by evaporation during hot weather and loss of heat during cold weather. The temperature at the time of placement shall not be more than 104 °F or 40 °C and the depth of the concrete layer laid shall not exceed 600mm. when the temperature is 40 °C.

402.7.2. Placing :—The concrete shall normally be placed and compacted within half an hour of mixing and shall not be subsequently disturbed. Method of placing shall be such as to preclude segregation. All concrete which has set before placement shall be rejected and immediately removed from site.

402.7.3. Placement under water :—When it is necessary to deposit concrete under water, the method, equipment, materials and proportion of the mix to be used shall be approved by the Executive Engineer before the work is started. Such concrete shall not be treated as "controlled concrete". The concrete mix shall contain atleast 10% more cement than that required for the same mix placed in dry conditions, the quantity of extra cement varying with the conditions of placing. The volume or weight of the coarse aggregate shall not be less than one and half times, not more than twice that of the fine aggregate. The materials shall be so proportioned as to produce a concrete having a slump of not less than 100mm. and not more than 150mm. Cofferdams or forms shall be sufficiently tight to ensure still water if practicable and in any case to reduce the velocity of water to less than 3m. per minute through the space into which concrete is to be deposited. Cofferdams or forms in still water shall be sufficiently tight to prevent loss of mortar through the walls. Pumping shall not be done while concrete is being placed and until 24 hours thereafter. Concrete shall be deposited continuously until it is brought to the required height. While depositing, the top surface shall be kept as nearly level as possible and the formation of seams avoided. The methods to be used for depositing concrete under water shall be one of the following:

402.7.3.1. Tremie :—When concrete is to be deposited under water by means of a tremie the top section of the tremie shall be of a hopper large enough to hold the entire batch of the mix or the entire contents of the transporting bucket if any. The tremie pipe shall not be less than 200mm. in diameter and shall be large enough to allow a free flow of concrete and strong enough to withstand the external pressure of the water in which it is suspended even if a partial vacuum develops inside the pipe. Preferably flanged steel pipe of adequate strength required for the job shall be used. A separate lifting device shall be provided for each tremie pipe with its hopper at the upper end. Unless the lower end of the pipe is equipped with an approved automatic check valve, the upper end of the pipe shall be plugged with a wadding of gunny sacking or other approved material before delivering the concrete to the tremie pipe through the hopper so that when the concrete is forced down from the hopper to the pipe it will force the plug (and along with it any water in the pipe) down the pipe and out of the bottom and thus establishing a continuous stream of concrete. It will be necessary to raise the tremie slowly in order to cause uniform flow of the concrete, but the tremie shall not be emptied so that water enters above the concrete in the pipe. At all times after the placing of the concrete is started and until all the concrete is placed the lower end of the tremie pipe shall be below the top surface of the plastic concrete. This will cause the concrete to build up from below instead of flowing out over the surface and thus avoid formation of laitance layers. If the charge in the tremie is lost while depositing, the tremie shall be raised above the concrete surface and unless sealed by a check valve it shall be re-plugged at the top end (as at the beginning), before re-filling for depositing concrete.

402.7.3.2. Drop bottom bucket :—The top of the bucket shall be open. The bottom doors open freely downward and outward when tripped. The bucket shall be filled completely and lowered slowly to avoid backwash. It shall not be discharged until it rests on the surface upon which the concrete is to be deposited and when discharged shall be withdrawn slowly until well above the concrete.

402.7.3.3. *Bags* :—(of at least 0.028 cu.m. capacity) of jute or other coarse cloth shall be filled about two thirds full with concrete, the spare end being turned under so that the bag is square ended and securely tied. They shall be placed carefully in header and stretcher courses so that the whole mass is interlocked. Bags used for this purpose shall be free from deleterious materials.

402.7.4. *Construction joints* :—Concreting shall be carried out continuously up to construction joints, the position and arrangement of which shall be predetermined by the Executive Engineer. When the work has to be resumed on a surface which has hardened such surface shall be roughened by chiseling, swept clean, thoroughly wetted and covered with a 12mm. layer of freshly mixed mortar composed of cement and sand (in the same ratio as the cement and sand in the concrete) immediately before the placing of the concrete. When the concrete has not fully hardened all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement grout. The first layer of concrete to be placed on the surface shall not exceed 150mm. in thickness and shall be well rammed against the old work, particular attention being paid to corners and close spots.

402.7.5. *Compaction* :—Concrete shall be thoroughly compacted during the operation of placing and thoroughly worked around the reinforcement, around embedded fixtures and into corners of form work. Wherever possible vibrators of the surface, form or immersion type shall be used. Over vibration or vibration of very wet mixes shall be avoided.

402.7.6. *Finishing* :—Exposed concrete is best finished while it is still green by floating. Concrete surfaces cast against forms shall normally not require any further finishing. If however, any defects are observed after removal of forms, any toughness or projections shall be removed by chipping and grinding with corborundum brick or a power grinding machine. Any hollows or honey combing shall be made good by the application of mortar having the same proportion as used in concrete and having as stiff a consistency as possible. No extra payment shall be involved for finishing concrete surfaces as mentioned above. If however for reasons other than defective work as mentioned above a cost of plaster has to be applied for which supplemental specifications are furnished, then the thickness and method of payment shall be defined in the schedule. Care shall be taken to roughen the hardened concrete surface by chiseling to get a good bond between the concrete surface and the plaster.

402.8. *Curing* :—Concrete shall be cured either by ponding or by covering with a layer of sacking-canvas, hessian or similar absorbent material which shall be kept constantly sprinkled with water. Alternatively the concrete being thoroughly wetted may be cured by a layer of approved water proofing material. Unless otherwise specified curing shall be continued for a period of three weeks.

402.9. Tests :

402.9.1. *Slump test* :—This test is used for measuring the workability of fresh concrete on the field as well as in the laboratory.

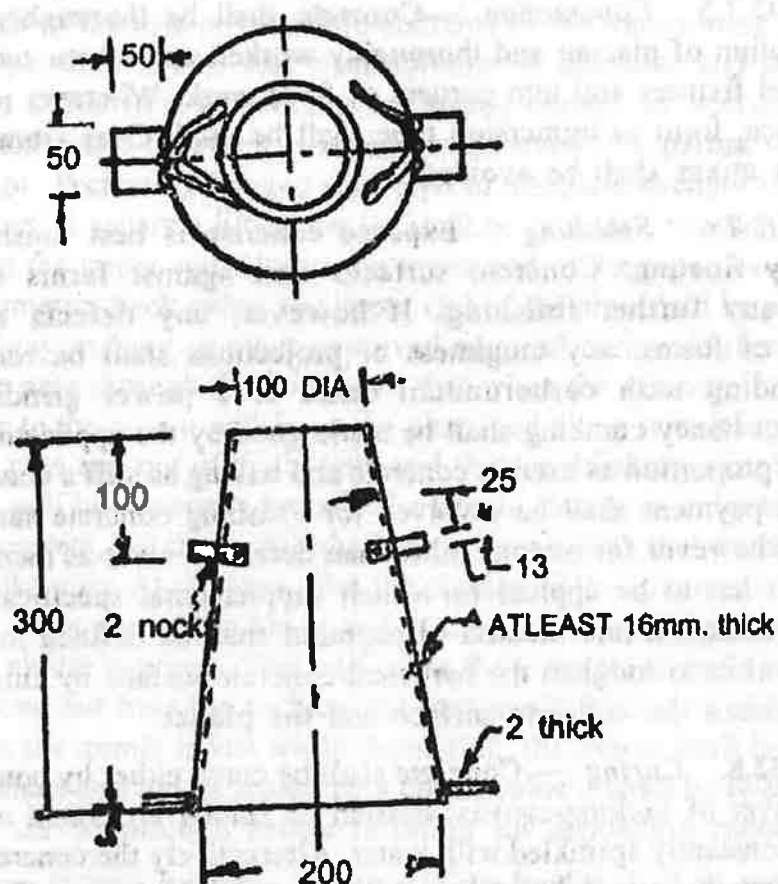
402.9.1.1. *Apparatus :*

(a) *Mould* :—The mould for the test specimen shall be in the form of frustrum of a cone having the following internal dimensions.

<i>Dimensions</i>	<i>mm.</i>
Bottom diameter	200
Top diameter	100
Height	300

The mould shall be constructed of non-corroding metal (brass or aluminium shall not be used) of atleast 1.6mm. thickness and the top and bottom shall open and at right angles to the axis of the cone. The mould shall have a smooth internal surface. It shall be provided with suitable foot pieces and also handles to facilitate lifting it up in a vertical direction as required by the test. A mould provided with a suitable guide attachment may be used. A typical mould without the guide is shown in Fig. 402-1.

TYPICAL MOULD FOR SLUMP TEST



All dimensions in mm.

[Fig. 402.1]

(b) *Tamping rod* :—The tamping rod shall be of steel or other suitable material 16mm. in diameter, 600mm. long and rounded at one end.

402.9.1.2. Sampling :—If this test is being carried out in the field the sample of freshly mixed concrete shall be used. In the case of concrete containing aggregate of maximum size more than 40mm. the concrete shall be wet sieved through 4mm. screens to exclude particles bigger than 40mm.

402.9.1.3. Procedure :—The internal surface of the mould shall be thoroughly cleaned and freed from superfluous moisture and any set concrete before commencing the test. The mould shall be placed on a smooth horizontal, rigid and non-absorbent surface, such as a carefully levelled metal plate the mould being firmly held in place while it is being filled. The mould shall be filled in 4 layers each approximately one quarter of the height of the mould. Each layer shall be tamped with 25 strokes of the rounded end of the tamping rod. The strokes shall be distributed in a uniform manner over the cross-section of the mould and for the second and subsequent layers shall penetrate into the under laying layer. The bottom layer shall be tamped throughout its depth. After the top layer has been rodded the concrete shall be struck off level with a trowel or the tamping rod, so that the mould is exactly filled. Any mortar which has leaked out between the mould and the base plate shall be cleaned away. The mould shall be removed from the concrete immediately by raising it slowly and carefully in a vertical direction. This allows the concrete to slump/subside and the slump shall be measured immediately by determining the difference between the height of the mould and that of the highest point of the slumped concrete. The above operations shall carried out at a place free from vibration or shock and within a period of 2 minutes after sampling. Any specimen which collapses or shears off laterally gives incorrect results. If this occurs the test shall be repeated with another sample. If in the repeat test also the specimen shears, the slump shall be measured and the fact that the specimen has sheared shall be recorded.

402.9.1.4. Very good indication of the cohesiveness and workability of the mix can be obtained, if after the slump measurement has been completed the side of the concrete is tapped gently with the tamping rod. A well proportioned concrete which has an appreciable slump will gradually slump further, but if the mix is harsh it is likely to fall apart.

402.9.2. Compressive strength test :—All the tests shall be done on hardened concrete in accordance with IS : 516-1959.

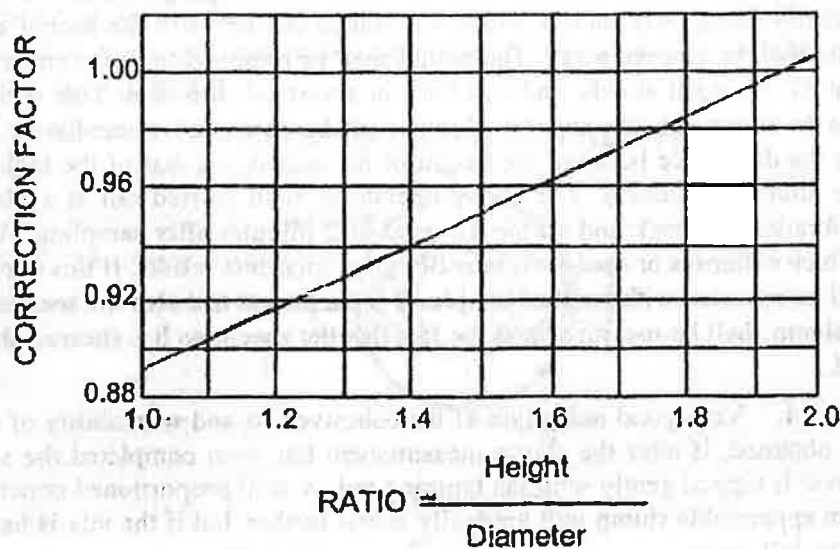
402.9.2.1. Cube test :

(a) Size of cubes :—In the works test with the approval of the Executive Engineer 100mm. cubes may be used in place of 150mm. cubes provided the maximum nominal size of the aggregate does not exceed 20mm. Even the use of 150mm. cubes shall normally be restricted to concrete having a maximum nominal size of aggregate not exceeding 40mm. Where concrete with aggregates larger than 40mm. size is required to be tested the size of cubes shall be specified by the Executive Engineer keeping in view that generally the length of the side of the cube shall be about four times the maximum nominal size of the aggregate in the concrete constituting the cube specimen. Alternatively 150mm. cube specimens may be used for such concrete by wet screening and removing aggregate pieces larger than 40mm. size.

(b) *Strength in relation to the size of the cube* :—When 100mm. cubes are used the values obtained from tests on 100mm. cubes shall be reduced to the extent established by comparative preliminary tests with 100mm. and 150mm. cubes (or in the absence of such comparative tests by 10 per cent of the value determined from the tests) in order to give the equivalent strength for 150mm. cubes. Where cubes larger than 150mm. are adopted generally no modification is necessary unless otherwise specified by the Executive Engineer.

402.9.2.2. *Cylinder Test* :—Compressive strength test may with the approval of the Executive Engineer be conducted on 150mm. diameter and 300mm. high cylinders in accordance with IS : 5-6-1959 instead of on cubes. Where cylinder strength figures are adopted the compressive strength figures given above shall be modified according to the formula :

Minimum cylinder compressive strength required \approx 0.8 compressive strength specified for 150mm. cubes.



[Fig. No. 402.2]

CORRECTION FACTOR HEIGHT/DIAMETER RATIO OF A CORE

402.9.2.3. *Core Test* :

Core specimen :—Core specimen for the determination of compressive strength shall be extracted from hardened concrete by using a diamond core bit or other suitable means. The diameter of the specimen shall preferably be atleast three times and in no case less than two times the nominal maximum size of the coarse aggregate. The length of the specimen shall be about twice its diameter and in no case less than the diameter. In case the height/diameter ratio is less than 20 the correction factor shown in Fig. 402.2 shall be applied to get the cylinder compressive strength. The corresponding cube strength shall be then got by adopting the formula in clause 402.9.2.2.

402.9.3. *Modulus of rupture test* :—The test shall be done in accordance with IS : 516-1959.

402.10. *Sample, size, sampling frequency and acceptance criteria* :—The number of test specimens required, the frequency of sampling and the criteria for acceptance of concrete as conforming to the specified grade shall be in accordance with Table V of IS : 456-1964 for both controlled and ordinary concrete.

402.11. *Measurement* :—This shall conform to clause 401.7.

402.12. *Rate* :—This shall conform to clause 401.8. The rate shall include cost of reinforcements also.

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1106. LAYING OF PIPE

No pipe shall be laid in position until the foundation has been approved by the Engineer.

Where two or more pipes are to be laid adjacent of each other, they shall be separated by a distance equal to at least half the diameter of the pipe subject to a minimum of 450 mm.

If the pipes are laid in two layers, the minimum horizontal and diagonal distance between pipes shall be same as specified above and the centres of pipes shall form vertices of equilateral triangles.

The pipes shall generally be laid as per IS:783.

The arrangement for lifting, loading and unloading concrete pipes from factory/yard and at site shall be such that the pipes do not suffer any undue structural strain or any damage due to fall or impact.

In manual unloading of pipes from the trucks, pipes shall be rolled down on a pair of skids hooked on to the trucks, and the movement shall be controlled with a rope passing round the pipes, back to a rail or station, etc. The pipes shall be placed as near to the edge of the trench as possible and as safety permits to avoid possible damage during re- transportation.

The arrangement for lowering the pipe in the bed shall be got approved by the Engineer. It may either be with tripod pulley arrangement or simply by manual labour with the help of ropes or by chain blocks, etc. in a manner that the pipe is placed in the proper position without damage. Hooks shall not be used in the ends of the pipe to lift or lower down as this procedure is likely to damage joint surfaces.

The longitudinal slope of the pipe shall not be flatter than bed slope subject to minimum of 1 in 1000 in plains. In case of culverts in hilly areas the longitudinal slope of the pipe shall be according to bed slope but not steeper than 1 in 30 unless otherwise specified on the drawings or directed by the Engineer.

The laying of pipes on the prepared foundation shall start from the outlet and proceed towards the inlet and be completed to the specified lines and grades. The invert of the pipe shall be minimum 150 mm below the average bed level. In case of use of pipes with bell-mouth, the belled end shall face upstream. The pipes shall be fitted and matched so that when laid in work, they form a culvert with a smooth uniform invert.

Any pipe found defective or damaged during laying shall not be used in the works and shall be removed at the cost of the Contractor.

1206 SUBSTRUCTURE**1206.1 Description**

The work shall cover furnishing and providing masonry or reinforced concrete substructure in accordance with the drawings and as per these Specifications or as directed by the Engineer.

1206.2 General

Dimensions, lines and levels shall be set out and checked with respect to permanent reference lines and permanent bench mark so that the substructure is constructed in accordance with the drawings.

Brick masonry, stone and concrete block masonry, concrete, formwork, steel reinforcement/prestressing/structural steel shall conform to Sections 600, 700, 800, 900 and 1000 respectively of these Specifications.

1206.2.1 For submersible bridges, the following additional guidelines shall be followed:

- i) The masonry substructure shall not be permitted if the height above foundations is more than 7 m.
- ii) The locations and levels of pier cap/abutment cap, pedestals, anchorage arrangements (between superstructure and pedestal/pier cap/abutment cap), side bearing pad between superstructure and raised portion of pier cap (thrust wall) and stainless steel rods in pedestal/bearings shall be carefully checked to ensure alignment in accordance with the drawings.
- iii) Dry rubble masonry shall not be permitted in retaining walls/breast walls, if required, in approaches of submersible bridges.
- iv) Pier cap including raised portion/stopper (thrust) wall, abutment cap and pedestals shall be given streamline shape as shown on the drawings or as directed by the Engineer

1206.3 Piers and Abutments

Piers and abutments shall be in brick/stone masonry or plain/reinforced concrete. Random rubble or dry rubble stone masonry shall not be permitted for piers and abutments. For concrete piers, horizontal construction joints shall be avoided as far as possible, by pouring the entire required concrete in one operation. Where construction joints are unavoidable, they shall be treated in accordance with Section 800 of these Specifications or in accordance with special provisions as directed by the Engineer. No vertical construction joint shall be permitted.

Construction joints shall not be permitted in splash zones.

The work shall be strictly in accordance with the drawings or as directed by the Engineer.

In case of tall piers and abutments, use of slip form shall be preferred. The design, erection and raising of slipform shall be subject to special specifications which will be furnished by the Contractor. The concrete shall also be subject to additional specifications as necessary. All specifications and arrangements for use of slipform and placing of concrete therein shall be subject to the approval of the Engineer.

The top surface of foundation/well cap/pile cap over which new concrete is to be laid, shall be scraped with wire brush and all loose materials removed. In case reinforcing bars projecting from foundations are coated with cement slurry, the same shall be removed by tapping, hammering or wire brushing. Care shall be taken to remove all loose materials around reinforcements. Just before commencing masonry or concrete work, the surface shall be thoroughly wetted.

In case of solid (non-spill through type) abutments and hollow concrete piers, weep holes as shown on the drawings or as directed by the Engineer, shall be provided in conformity with Clause 1206.6 of these Specifications.

The surface finish shall be smooth, except on the earth face of abutments which shall be rough finished.

In case of abutments likely to experience considerable movement on account of earth pressure from backfill of approaches and settlement of foundations, the construction of the abutment shall be followed by filling up of embankment in layers to the full height to allow for the anticipated movement during construction. Casting of superstructure resting on the abutment shall be taken up only thereafter.

The backfill behind solid abutments, wings and return walls shall conform to the specifications given in IRC:78. The filter material shall be well packed to a thickness of not less than 600 mm with smaller size towards the soil and bigger size towards the wall and provided over the entire surface behind abutments, wings or return walls to the full height.

Filter materials need not be provided in case of spill through type of abutments.

1206.4 Pier Cap and Abutment Cap

The locations and levels of pier cap, abutment cap, pedestals and bolts for fixing bearings shall be checked carefully to ensure alignment in accordance with the drawings.

The surface of cap shall be finished smooth and shall have a slope for draining off water as shown on the drawings or as directed by the Engineer. For short span slab bridges with continuous support on pier caps, the surface shall be cast horizontal. The top surface of the pedestal on which bearings are to be placed shall also be cast horizontal.

The surface on which elastomeric bearings are to be placed shall be wood float finished to a level plane which shall not vary more than 1.5 mm from straight edge placed in any direction across the area. The surface on which other bearings (steel bearings, pot bearings) are to be placed shall be cast about 25 mm below the bottom level of bearings or as indicated on the drawings.

1206.5 Dirt wall, Return wall and Wing wall

In case of cantilever return walls, no construction joint shall be permitted. The dirt wall and cantilever return walls shall be cast in one operation.

For gravity type masonry and concrete return and wing wall, the surface of foundation shall be prepared in the same manner as that prescribed for construction of abutment. No horizontal construction joint shall be provided.

Vertical construction joint may be provided, if shown on the drawing or as directed by the Engineer.

Vertical expansion gap of 20 mm shall be provided in return wall / wing wall at every 10 metre intervals or as directed by the Engineer. The 20 mm gaps shall be filled with suitable type of asphaltic/bituminous board, so as to prevent embankment material from coming out. The cost of such board shall be borne by the Contractor and shall be incidental to the work.

For masonry/concrete return walls and wing walls, weep holes shall be provided as prescribed for abutments or as shown on the drawings.

The finish of the surface on the earth side shall be rough while that of the front face shall be smooth.

Coping for wing wall/return wall in brick masonry or stone masonry shall conform to Sections 600 and 700 of these Specifications.

1206.6 Weep Holes

Weep holes shall be provided on all plain concrete, reinforced concrete, brick and stone masonry structures such as, abutment, wing wall and return walls as shown on the drawings or as directed as by the Engineer to permit water to flow out without building up pressure in the back fill. Weep holes shall be provided with 100 mm diameter AC/PVC/HDPE pipe for structures in plain/reinforced concrete or brick masonry. In case of stone masonry, weep holes shall be of rectangular shape 80 mm wide, 150 mm high or circular with 150 mm diameter. Weep holes shall extend through the full width of concrete/masonry with slope of about 1 vertical: 20 horizontal towards the draining face. The spacing of weep holes shall be 1 m in either direction or as shown in the drawings with the lowest at 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer.

1206.7 Tests and Standards of Acceptance

The materials shall be tested in accordance with these Specifications and shall meet the prescribed requirements.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

1206.8 Tolerances in Concrete Elements

i)	Variation in cross-sectional dimensions	:	+10 mm, -5 mm
ii)	Misplacement from specified position in plan	:	10 mm
iii)	Variation of levels at the top	:	±10 mm
iv)	Variations of reduced levels of bearing areas	:	± 5 mm
v)	Variations from plumb over full height	:	±10 mm
vi)	Surface unevenness measured with 3 m straight edge All surfaces except bearing areas	:	5 mm
	Bearing areas	:	3 mm

1206.9 Measurements for Payment

Masonry in substructure shall be measured in cubic metres in accordance with Sections 600 and 700 of these Specifications, based on the quantities ordered or as shown on the drawings.

Concrete in substructure shall be measured in cubic metres in accordance with Section 800 of these Specifications, based on the quantity ordered or as shown on the drawings. No deduction shall be made for weep holes.

Steel in concrete of substructures shall be measured in tonnes, in accordance with Section 1000 of these Specifications, based on the quantity ordered or as shown on the drawings.

Weep holes in concrete/brick masonry structure shall be measured in numbers. For structures in stone masonry, weep holes shall be deemed to be included in the item of stone masonry work and shall not be measured separately.

1206.10 Rate

The contract unit rates for masonry, concrete and reinforcement and structural steel shall include all works as given in respective Sections of these Specifications and cover all incidental items for furnishing and providing substructure as mentioned in these Specifications and shown on the drawings.

The contract unit rate for weep holes shall include the cost of all labour, material, tools and plant required for completing the work as per these Specifications

